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CONTENT

Exploring the Customer Journey of Voice Commerce: A Research Agenda

By Eva Böhm, Andreas Eggert*, Ina Garnefeld, Hartmut H. Holzmüller, Tobias Schaefers, Lena Steinhoff, David M. Woisetschläger

Eva Böhm is Assistant Professor of Marketing at TU Dortmund University, Germany, E-Mail: eva.boehm@tu-dortmund.de

Andreas Eggert is Professor of Business and Services Marketing at Freie Universität Berlin, Germany, E-Mail: marketing@fu-berlin.de
*Corresponding Author

Ina Garnefeld is Professor of Service Management at University of Wuppertal, Germany, E-Mail: garnefeld@uni-wuppertal.de

Hartmut H. Holzmüller is Professor of Marketing at TU Dortmund University, Germany, E-Mail: hartmut.holzmueller@tu-dortmund. de

Tobias Schaefers is Professor of Marketing at TH OWL (OWL University of Applied Sciences and Arts) in Lemgo, Germany, and Associate Professor of Marketing at Copenhagen Business School, Denmark, E-Mail: ts.marktg@cbs.dk

Lena Steinhoff is Assistant Professor of Service Management at University of Rostock, Germany, E-Mail: lena.steinhoff@uni-rostock.de

David M. Woisetschläger is Professor of Service Management at TU Braunschweig, Germany, E-Mail: d.woisetschlaeger@tu-braunschweig.de

Voice commerce creates unprecedented opportunities for consumers and vendor firms to interact, engage, and relate. With artificial intelligence–powered voice assistants, consumers can make technology-mediated purchases without using their tactile senses, which represents a new space for commercial interactions. Drawing on the customer journey as an organizing framework, this article proposes a structured research agenda, in an attempt to shed light on the bright side effects of voice commerce while also acknowledging concerns for consumer protection and society in general. Voice assistants can enhance every stage of the purchase journey, yet their use might have negative consequences for customer relationships. In the prepurchase stage, voice assistants can act as information curators or manipulators. In the purchase stage, voice assistants can adopt roles as shopping concierges or impediments. In the postpurchase and usage stage, voice assistants can become trusted relationship partners or hostile intruders in consumers' lives.

1. Introduction

Voice commerce—such that consumers rely on artificial intelligence (AI)–powered voice assistants to perform shopping tasks—is a rapidly growing area of e-commerce, with vast potential to change how consumers and vendor firms interact, engage, and relate to one another (Dellaert *et al.*, 2020; Mari and Algesheimer, 2021; Whang and Im, 2021). Unlike traditional e-commerce, for which consumers interact with vendors using input devices such as touch displays, a mouse, or a keyboard, voice assistants, due to their specific characteristics (e.g., hearing, understanding, interacting), enable consumers to make technology-mediated purchases without using their tactile senses. As a result, consumers gain more freedom to engage in shopping activities, even if operating tactile input devices would be inconvenient, mentally challenging, or otherwise impossible. Furthermore, voice assistants can function like shopping companions that provide consumers with information, understand and respond to their commands, and place orders on their behalf.

Such benefits have prompted the ubiquity of voice assistants (Bawack *et al.*, 2021): In 2020, 4.2 billion voice assistants were available to consumers worldwide, and this number is projected to grow to 8.4 billion by 2024 (Statista, 2020). They appear in regularly used electronic devices such as mobile phones, as well as smart speakers, which represent the fastest growing consumer electronics segment in recent years. These prevalent AI-powered voice assistants in turn may represent a disruptive technology for building and maintaining consumer–vendor relationships (Mari *et al.*, 2020). Their humanlike ability to listen to consumers and communicate in natural language makes them powerful agents for customer experience management throughout the customer journey. At every stage of the purchase process, voice assistants can enhance customer and vendor value, or they might exert negative effects on customer relationships. In the prepurchase stage, they can act as information curators or as manipulators. In the purchase stage, voice assistants might be shopping concierges, or they could be impediments. In the postpurchase and usage stage, voice assistants can function as trusted experience partners or as hostile intruders in consumers' lives.

To address these potential outcomes, we propose a structured agenda for voice commerce research. To organize our research agenda in a parsimonious way, we apply the customer journey framework and identify promising avenues for research along prepurchase, purchase, and postpurchase stages. We identify and discuss potential research questions pertaining to bright side and dark side effects of voice commerce and highlight concerns regarding customer protection and society in general. Because voice commerce mainly is developing in consumer markets, we focus on business-to-consumer (B2C) settings. In particular, we start by proposing a conceptualization of voice commerce and how it relates to and is distinct from e-commerce. Then we introduce the customer journey as an organizing framework to theorize about the bright and dark sides of voice commerce. Next, we discuss the role of voice assistants along the customer journey and identify promising research avenues. Finally, we wrap up our special research paper with a brief conclusion.

2. Conceptual Background

2.1. Voice Commerce

Voice commerce refers to purchases or sales of goods and services through digital channels with the aid of voice assistants (Mari *et al.*, 2020; Sun *et al.*, 2021). These voice assistants, as AI-powered software applications, communicate with consumers through natural, spoken language (Ewers *et al.*, 2020; Uysal *et al.*, 2022). Their commercialization has produced two main types: built into multipurpose devices such as smartphones, tablets, or notebooks (e.g., Apple's Siri, Microsoft's Cortana) or integral to standalone speaker devices (e.g., Amazon's Alexa). When they interact with these voice assistants, consumers listen to and speak with a humanoid, omnipresent agent that provides curated information, based on its foundational AI. In early applications, consumers mainly sought convenient assistance to complete everyday tasks, and popular voice assistant interactions involved simple commands, such as providing weather information, setting alarms or reminders, playing music, or initiating phone

calls (Mari *et al.*, 2020). Voice-based purchases of goods and services seemingly represent the next stage of voice assistant utilization.

More generally, e-commerce is defined as the buying and selling of goods and services via the Internet using fixed (e.g., personal computer) or mobile (e.g., smartphone) input devices (Lee *et al.*, 2007; Wareham *et al.*, 2005). In a sense then, voice commerce and e-commerce share an important characteristic: They both represent Internet-based channels through which consumers can purchase goods or services. Yet voice commerce also has specific characteristics that set it apart from traditional e-commerce (see Table 1). It relies on verbal communication, whereas traditional e-commerce employs visual and textual communication cues. Unlike e-commerce, which relies on sight and touch as primary senses, consumers interact with voice assistants through non-haptic, verbal-only operations, so the only sense involved is hearing. Furthermore, voice commerce offers a humanoid interface, powered by AI and natural spoken language; e-commerce interactions (e.g., with websites or apps) are more technical in nature. Due to voice assistants' ubiquitous presence (i.e., constant listening) and provision of a limited amount of curated information, voice commerce tends to be more proactive. E-commerce instead adopts a reactive, on-demand approach, and consumers self-select the information they want to process. Table 1 synthesizes these key defining features of voice commerce to delineate how it is similar to and also differs from traditional e-commerce formats.

Key Characteristic	Voice Commerce	Traditional E-Commerce
Purpose	Purchasing goods and services	Purchasing goods and services
Primary communication cues	Verbal	Visual, textual
Primary senses involved	Hearing	Sight and touch
Sending and receiving information	Speaking (sending) and listening (receiving)	Typing or touching (sending) and seeing or reading (receiving)
Appearance	Humanoid	Technical
Presence	Ubiquitous presence	On demand
Information presentation	Curated information	Self-selected information
Recognition of environmental cues	AI (voice recognizes what consumer is doing while communicating), tone, emotional state, proactive	Reactive

Tab. 1: Distinguishing Voice Commerce from Traditional E-Commerce

2.2. Customer Journey Framework

To clarify the unique characteristics of voice commerce, we turn to the customer journey framework, which consists of a three-stage cycle (Lemon and Verhoef, 2016). Voice commerce can support consumers' purchase-related activities throughout prepurchase, purchase, and postpurchase stages. Several stage-overarching contingency factors affect the voice commerce customer journey too, as Figure 1 indicates.

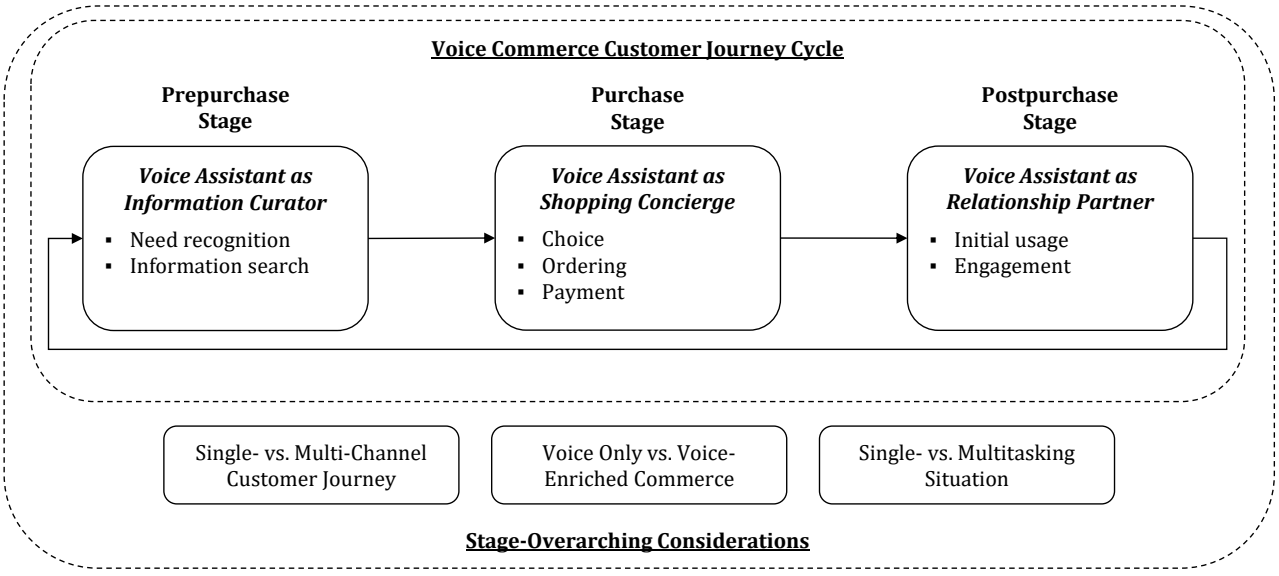

Fig. 1: Voice Commerce Customer Journey

The process begins in the prepurchase stage. It consists of all purchase-relevant customer actions that take place prior to the actual purchase, which can be categorized according to two steps: need recognition and information

search. The need to purchase a specific type of product can be spurred by internal (e.g., inner perceptions) or external (e.g., vendors' marketing activities) drivers. Consumers can turn to voice assistants to find information, with curated details about different product alternatives. The actual act of buying the product occurs in the purchase stage, which encompasses three major steps: choice, ordering, and payment. Choice is the primary task to fulfill, such that consumers select an option from an evoked set of available alternatives. To order, consumers also must make selections, such as among product delivery options. In the last element of the purchase stage, consumers place their orders by selecting and authorizing payment. After the purchase, consumers enter the postpurchase stage of the customer journey. It comprises their initial usage of the purchased product and their product-related engagement behavior over the course of their continuous usage. The postpurchase stage is critical; at this stage of their journey, consumers reconcile perceived performance with their prior expectations, which ultimately determines their repurchase and cross-buying intentions (Puccinelli *et al.*, 2009).

In the following, we provide an in-depth assessment of the specific features of voice commerce, then pose research questions pertaining to the prepurchase, purchase, and postpurchase stages. We also acknowledge several overarching, stage-independent phenomena related to voice commerce.

3. Research Agenda

3.1. Prepurchase Stage: Voice Assistant as Information Curator versus Manipulator

The humanoid appearance of voice assistants and the verbal communication cues they offer influence consumers in the prepurchase stage. In addition to their positive consequences, negative outcomes may arise, in terms of privacy and perceived manipulation. These likely implications lead to several important research questions, as listed in Table 2.

Area	Research Questions
Prepurchase Stage: Voice Assistant as Information Curator versus Manipulator	
Need Recognition	RQ1.1: How does voice commerce affect **impulsive/unplanned purchases**? ■ Does deactivating the purchasing feature/shopping function of a voice assistant decrease impulse buying? ■ What role do price promotions take for impulse buying in voice commerce? RQ1.2: Can voice commerce stimulate **new shopping impulses** during information search? ■ Can voice commerce stimulate cross-selling/up-selling? ■ How does voice commerce influence switching barriers?
Information Search	RQ1.3: How does voice commerce affect the perceived **value of information**? ■ What effects do individual search profiles that allow for personalized information selection have? ■ What role do external quality signals and third-party information (e.g., product reviews) play in voice commerce? RQ1.4: How does voice commerce facilitate **information processing**? ■ Is voice commerce particularly suitable for promoting products that rely on automated information processing (e.g., habitual purchases, search products)? ■ What role do product comparisons have in voice commerce? ■ For whom is information processing through voice assistants most suitable? RQ1.5: What is the role of the perceived **confidentiality of information search** in voice commerce? ■ Do consumers perceive voice commerce as a source of sensitive information? ■ What influences perceptions of the confidentiality of information search in voice commerce?

Tab. 2: Research Questions Related to the Prepurchase Stage

Need recognition. The customer journey starts with the recognition of a need. Compared with traditional e-commerce, voice commerce raises two major differences in need recognition: the likelihood and pace of reacting to internal needs and the adequacy and availability of external purchase stimuli.

Reaction to internal needs. With voice agents, customers can make purchases directly, such that they can react to shopping impulses immediately, without any temporal or cerebral limitations (Klaus and Zaichkowsky, 2021). Customers thus might be more likely to pursue shopping impulses they have "along the way", such

as while cooking, driving, or watching TV. Voice commerce might encourage impulsive buying behavior for two reasons. First, the possibility to act directly on identified needs facilitates impulsive shopping. Second, according to Kleese *et al.* (2015), preference expression modalities affect impulsive buying. Customers are less self-controlled when talking instead of manually expressing a preference, such as by writing or pressing a button. Therefore, they may be more likely to make an impulsive choice when ordering through voice agents.

Although strategies for reducing impulsive shopping have been identified for offline commerce (Inman *et al.*, 2009), most of them (e.g., cash payment, writing a shopping list) are not applicable to voice commerce. Therefore, we need insights into specific strategies for reducing unplanned and impulsive buying in voice commerce (RQ1.1). Perhaps, for example, deactivating the voice-based purchasing feature would be useful for customers who want to reduce their impulsive buying through voice agents (Munz and Moritz, 2019). They still can search for products and even place items in their shopping carts, but to finalize the order, they need to visit the app or online shop. This extra effort, time delay between search and purchase, and combination of different preference expression modalities (i.e., speaking and button-pressing/writing) could reduce impulsive shopping. Considering how impulsive buying can be triggered by different marketing stimuli (Iyer *et al.*, 2020), it may be important to understand the effects of varying price discounts in voice commerce too.

Activation by external stimuli. Voice commerce is a double-edged sword for the external stimulation of customer needs: It increases the accuracy of these external stimuli but limits their availability. Depending on the characteristics of voice agents, such as context awareness and self-learning, they usually can trigger customer needs with high accuracy. Voice agents are good at making customers aware of a need, even before customers realize that need themselves (Mari *et al.*, 2020). However, this high accuracy might lead voice agents to remind customers of a need by (re-)presenting a previously purchased product instead of alternatives, resulting in a limited number of external stimuli (Mari, 2019; Mari *et al.*, 2020) and the risk of lock-in effects, which undermine consumers' variety seeking (Mari *et al.*, 2020). Such patterns may have negative consequences for the introduction and dissemination of new products and brands, which struggle to gain access to the customer's awareness set (Mari *et al.*, 2020).

To match the benefits of other shopping channels, voice commerce needs to find ways to stimulate cross-selling or up-selling (RQ1.2). For example, voice assistants might give recommendations of new products or product categories that reflect customers' previous purchases (e.g., "You just decided to buy…. Other customers buying this product also bought XY"; "Related to your purchase of XY, I would also recommend…"). Additional research might explore how voice commerce influences switching barriers. On the one hand, voice-based interactions could increase lock-in effects, due to the curated nature of the information presented. On the other hand, when voice assistants regularly present alternatives to customers' preferred choices, thereby expanding their awareness set, they may facilitate efforts to overcome switching barriers. Therefore, research might elaborate how new products/brands can ensure that they become part of customers' evoked sets in voice commerce.

Information search. Customers increasingly use voice assistants as a source of information, but little research has addressed their perceived value as information search channels. We predict that voice assistants might function as valuable information curators that help customers make well-informed purchase decisions, or they might appear to manipulate the information. We thus derive potential benefits and drawbacks of voice commerce for consumers' information search, due to its specific characteristics. During the information search stage, customers have three goals: to (1) receive valuable information, (2) reduce the cognitive effort associated with processing the information, and (3) ensure confidentiality in their information search. We address these three objectives separately in our analysis.

Information transmission. Information transmission is the extent to which an information source "provides consumers with resourceful and helpful information" (Lim and Ting, 2012, p. 51). Voice commerce can have both positive and negative effects on customers' perceptions of the value of information, due to its specific characteristics. In particular, the substantial personalization of information provided by voice assistants might enhance its informativeness for consumers. Product suggestions made by voice agents build on consumers' previously expressed requirements, preferences, and purchases (Klaus and Zaichkowsky, 2021), so the information likely is more helpful and suitable for consumers than if they were searching independently (Mari *et al.*, 2020).

Yet information conveyed by voice assistants also might appear less valuable to customers, for three reasons. First, voice commerce, unlike other channels, offers limited capacity to present search attributes (Figure 2), which also limits its information transmission. Some attributes that can be evaluated before purchase in offline commerce, such that they are search attributes (e.g., color of a sweater), become experience attributes that can be assessed only after purchase in voice commerce (Nelson, 1970). In offline settings, vendors have various opportu-

nities to present search attributes and reduce customer prepurchase uncertainty, such as by allowing customers to touch, feel, or smell a product. In online commerce, the presentation of such search qualities is constrained; online vendors cannot give customers opportunities to touch or smell a product, so they suffer greater uncertainty compared with what they experience through offline commerce (Kim and Krishnan, 2015). In voice commerce, the options for presenting search qualities are even more constrained. Without visual input, vendors must rely solely on auditory cues to describe products. Thus, product attributes (e.g., product design) that are search qualities in both offline and online commerce also transform into experience qualities in voice commerce. According to Mari *et al.* (2020, p. 5), customers only accept the limited information transmission in voice commerce because online commerce "has paved the way for voice shopping, bringing consumers to overcome the initial diffidence of buying without directly seeing, touching, or smelling an object."

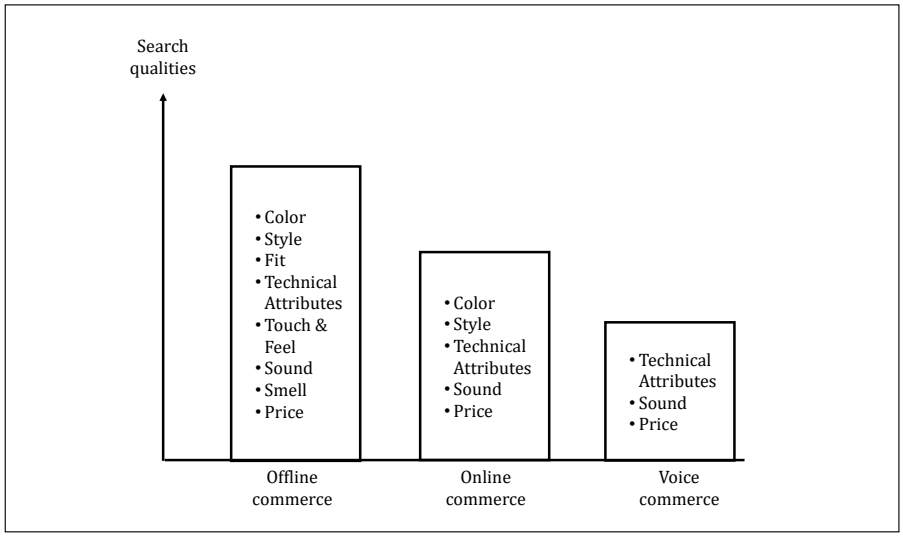

Fig. 2: Extent of Search Qualities in Offline, Online, and Voice Commerce

Second, compared with conventional commerce, voice commerce offers customers only limited information about alternatives and attributes. Typically, only a single item is suggested initially, and customers may receive information about its name, potential variants, and price. The absence of additional information, such as visual cues or product descriptions, can increase customers' perceived uncertainty.

Third, consumers perceive information provision by voice assistants as less transparent, because the determination of alternatives and the underlying algorithm that defines them represent a "black box" to consumers (Mari, 2019; Rzepka *et al.*, 2020). For example, Alexa often recommends an Amazon Choice product in a particular category as a default option; the criteria that leads a product to be categorized as an Amazon Choice are not obvious to consumers though, so they may assume that the choice reflects company rather than consumer interests. As a consequence, they experience substantial uncertainty about whether the presented alternative actually represents the best available option for them (Chernev *et al.*, 2015). Moreover, if consumers perceive a lack of autonomy and control over their information search (Mari *et al.*, 2020; Rzepka *et al.*, 2020), it may have detrimental effects on their attitudes and behaviors.

Continued research should investigate different strategies to enhance the value of information search through voice agents and improve the trade-off between personalization and perceived manipulation (RQ1.3). Customized search profiles could be a promising way to reap the benefits of personalization while providing more search autonomy to consumers. By leveraging their customized search profiles, consumers could influence the information selection in such a way that the voice assistant always includes specific alternatives, attributes, and criteria that the consumer deems important. By offering default options that facilitate socially desirable decisions (e.g., sustainable products), such customized search profiles also could constitute a promising nudging strategy. To enhance the perceived credibility of information, providers should strive to promote transparent information selection and reveal the criteria for the selection of recommended options. In support of such efforts, we need research into the perceived credibility of different selection criteria, both internal (e.g., consumer's purchase history) and external (e.g., favorite choice of consumers buying similar products). External quality signals, such as product reviews or test results, also might improve information transmission and reduce consumers' purchase uncertainty. Because of the lack of search qualities in voice commerce, consumers generally experience substantial

uncertainty prior to purchase, so research should determine if the effectiveness of product reviews might be even greater for voice commerce compared with other forms of commerce.

Reduction of effort. Information sources also vary with regard to the cognitive effort associated with processing the information they provide. Voice commerce seemingly demands different effort, but the amount is unclear. That is, some researchers argue that voice commerce requires less cognitive effort by consumers (e.g., Tassiello *et al.*, 2021; Klaus and Zaichkowsky, 2021), mainly due to the restricted amount of information available, in combination with the high personalization of that information. The opportunity to undertake an information search with a simple command and preselect alternatives, in the form of a default option, can enable a nearly automated buying experience that requires only minor consumer effort (Tassiello *et al.*, 2021). Such information processing is highly suitable for habitual and repeat purchases of low-involvement products that evoke little motivation for consumers to search for or process information (Klaus and Zaichkowsky, 2021).

But other studies take an opposing view and propose that voice commerce impedes information processing (e.g., Munz and Morwitz, 2019). Due to the exclusively auditory presentation of information, information processing may be more difficult in voice commerce, compared with visual information, considering that auditory information is "speaker-paced, ephemeral and described in a sequence of the speaker's choosing" (Munz and Morwitz, 2019, p. 48). In turn, it is more difficult for consumers to compare alternatives and apply decision heuristics during information processing through voice commerce. According to Munz and Morwitz (2019), such choice difficulty may prompt consumers to rely on the assistant's recommendation, or it can lead to a greater likelihood of choice deferral, especially for high-involvement decisions, for which consumers have a strong interest in finding the most suitable alternative.

Future research should identify tactics to help realize the benefits of automated information processing and circumvent the potential threats of manual information processing using auditory information (RQ1.4). To specify scenarios in which automated information processing through voice commerce might be most suitable, research could examine differences across product types. For example, it would be interesting to compare purchase behavior related to search products versus experience products. It seems relevant for voice assistants to guide and support information processing by consumers too. Researchers thus could address the effectiveness of different presentation modes, such as product rankings or guided filtering options. The effectiveness of these instruments might depend on individual consumer characteristics, in that people differ in their ability to memorize, visualize, or process acoustic information (Munz and Morwitz, 2019). We thus need evidence about for whom information processing through voice assistants is most suitable and most effective (Munz and Morwitz, 2019).

Confidentiality. An important concern that consumers face during information search involves confidentiality (Kumar *et al.*, 2016). In a positive sense, voice commerce could represent a valuable source of information about sensitive issues. Consumers often prefer to consult impersonal sources (e.g., websites, robots) rather than interpersonal sources (e.g., friends, company representatives) to gather information about sensitive issues (e.g., finances, health; Holthöwer and van Doorn, 2022). Voice commerce combines the advantages of impersonal and interpersonal sources, because it ensures confidentiality with regard to sensitive issues while also evoking the social presence of interpersonal relationships, so it might be an attractive source of sensitive information.

In a negative sense though, voice commerce can threaten data privacy (Bawack *et al.*, 2021; Kowalczuk, 2018; Tuzovic and Paluch, 2018). Consumers worry that voice assistant providers might collect personal information without their knowledge, build profiles of them, or track their electronic footprints (Kumar *et al.*, 2016). Moreover, their personal data might be at risk of being hacked or leaked to criminals who seek to exploit uses of voice assistants (Kowalczuk 2018). These privacy threats might increase perceptions of vulnerability (Martin *et al.* 2017) and cause consumers to limit their information search through voice commerce.

Future research should identify strategies to realize the benefits and circumvent such confidentiality and privacy threats (RQ1.5). First, voice assistants could be promoted as a source of sensitive information explicitly, which might suggest new applications. Researchers should test whether voice assistants really are perceived as valuable sources of sensitive information, as well as find the circumstances in which an interaction with a voice assistant seems very confidential, such that it alleviates customer embarrassment. A parasocial relationship (Flaswinkel et al., 2022; Whang and Im, 2021), perceived similarity with the voice assistant (Reinkemeier and Gnewuch, 2022), and perceived power (Tassiello *et al.*, 2020) all might be important drivers of consumer trust in these situations. Moreover, voice assistant providers should attend carefully to consumers' data privacy concerns. Prior research identifies two main strategies to cope with data privacy issues: data use transparency and customer control (Martin *et al.*, 2017). Therefore, the providers that market voice assistants should offer substantial transparency about their data collection, use, and storage procedures, as

well as enable consumers to review and control which personal information the voice assistant has. Researchers might examine potential trade-offs between perceived convenience (enabled by data provision) and privacy (ensured by data reservation).

Overall, voice commerce has both beneficial and detrimental effects related to the different activities that consumers perform during the prepurchase stage. Even if voice assistants may provide value through their information curation, they also might be perceived as manipulative and thus as a threat to consumers' independent information search.

3.2. Purchase Stage: Voice Assistant as Shopping Concierge versus Impediment

The purchase stage encompasses three main steps: choice, ordering, and payment. Voice commerce supports nearly seamless transitions, from choice to ordering to payment, so most research does not differentiate among these steps and collapses them (e.g., Munz and Morwitz, 2019). Arguably, the distinction between choice and order becomes superfluous in voice commerce, which then would raise several challenges that research can address. We take a more fine-grained view on sequential choice-, ordering-, and payment-related issues in voice commerce to assess how, during the purchase process, voice assistants can act as a shopping concierge that supports consumers' choice, ordering, and payment, but also how it might impede these processes. Value for consumers in the purchase stage of the customer journey is a relevant subject for future research. We suggest specific insights and research directions for all three steps in the purchase stage next, as synthesized in Table 3.

Area	Research Questions
Purchase Stage: Voice Assistant as Shopping Concierge versus Impediment	
Choice	RQ2.1: Can **voice assistants** facilitate choice?
	■ Does **voice style** (e.g., artificiality, gender, tone, pace) affect consumer choice for different types of products?
	■ What **informational cues** presented/emphasized by voice assistants (e.g., brand name, product features, price, online reviews) have the greatest impact on consumer choice?
	■ Do voice assistants facilitate choice for purchases of **high-involvement products**?
	RQ2.2: How do consumers exert **control** over voice commerce?
	■ Do **simultaneous activities** occupying other senses affect consumers' control?
	■ Does a **verbal versus touch command** affect consumers' sense of control?
	■ How can **vendors** increase consumers' perceptions of control and transparency?
	RQ2.3: How does voice commerce affect consumers' **self-control**?
	■ Does voice commerce stimulate **indulgent choices**?
	■ Are consumers more or less **price sensitive** when purchasing through voice commerce?
Ordering	RQ2.4: How do **external conditions** affect consumers' ordering behavior?
	■ Do **situational cues** such as buying sensitive products affect consumers' ordering behavior?
	■ Do **environmental cues** such as using voice commerce in private versus public spheres affect consumers' ordering behavior?
	RQ2.5: Does voice commerce lead to or stimulate **fragmented ordering behavior**?
	■ Does voice commerce create **coordination problems** within households?
	■ How can the **negative externalities of fragmented ordering behavior** be avoided?
Payment	RQ2.6: Given payment data sensitivity, do consumers exhibit enhanced **data privacy concerns** in voice commerce relative to e-commerce or offline retail?
	■ Does the **danger of being overheard** affect consumers' data privacy concerns?
	■ Does the **humanoid nature of voice assistants** increase or decrease data privacy concerns, compared with technical interfaces?
	RQ2.7: Which **price-related psychological effects** gain relevance in the payment stage of voice commerce?
	■ How does hearing rather than seeing monetary values affect consumers' **overview of expenses** (similar to different perceptions of cash versus credit card payments)?
	■ Does voice commerce affect consumers' **pain of paying**?
	■ Do consumers tend to **split purchase baskets** into several lower value orders rather than one combined higher value order?
	■ Do higher **shopping cart values** increase consumers' tendency to abandon the purchase, more so than in online or offline commerce?

Tab. 3: Research Questions on Voice Commerce in the Purchase Stage

Choice. When consumers enter the purchase stage, their primary task is to make a *choice* and select an option from an evoked set of available alternatives. In voice commerce, consumers rely on a limited set of communication cues and senses. Because they exchange verbal cues with the voice assistant, they exclusively process

information through their sense of hearing.[1] In other commerce formats, consumers leverage more senses and communication cues. For example, in e-commerce, consumers process visual, textual, and potentially verbal (e.g., product videos) information, using their sight and hearing. In offline retail, haptic and olfactory cues also might be available, which consumers can process with their senses of touch, smell, or taste.

Fully relying on sending and receiving verbal information has important, mixed implications for consumer choice. On the bright side, voice commerce may make consumer choices more convenient, by facilitating both decision making and choice execution (RQ2.1). First, it simplifies decision making by presenting consumers with a limited, curated, evoked set of alternatives. They can inform the evoked set themselves, through their search and evaluation activities in the prepurchase stage (e.g., adding products to a short list). But even if they rely on voice assistants' recommendations, those suggestions likely are based on the consumers' purchase histories or seller-induced promotions. Second, voice commerce expands choice execution capacities to settings where purchase choices previously might not have been feasible. For example, consumers can make product choices even if they cannot apply senses typically required to make choices, such as sight, while engaged in activities that require that capacity (e.g., while driving a car). Then their choices can be put into effect through verbal commands, which eliminates the need for manual implementation efforts (e.g., clicking on a button on a computer or mobile device while doing household chores). Extant research on voice commerce emphasizes these bright sides, citing the gains in convenience as a major consumer-perceived benefit of purchasing through voice commerce (e.g., Klaus and Zaichkowsky, 2020, 2021; Kraus *et al.,* 2019; Rzepka *et al.,* 2020). Choice also might be affected by the style of the voice, such as its seeming artificiality (Guha *et al.,* 2022), as well as by the availability of particular information cues, such as brand and price information, depending on the consumers' product involvement.

Yet, choice execution and decision making through voice commerce also incur a potential dark side, related to consumers' limited control over voice commerce (RQ2.2). This lack of control evokes consumer skepticism (Rzepka *et al.,* 2020). For example, information presented verbally is more difficult to process than the same information presented in writing, due to the augmented burden it places on working memory (Munz and Morwitz, 2019). Therefore, it is not surprising that consumers thus far have used voice commerce mainly for low-involvement products (Klaus and Zaichkowsky, 2020, 2021; Tassiello *et al.,* 2021). Because voice commerce enables choice execution in parallel, or potentially secondary to, other activities, it can be challenging for consumers. If the task competes for consumers' attention with other, potentially more primary activities, choice execution might become arduous and error-prone. For example, if consumers devote only limited or interrupted attention to the list of options presented by the voice assistant, they may need to listen to the list of options over and over again. Background noise also easily impedes the quality of this communication channel, such that consumers' verbal commands may be misunderstood by voice assistants and prompt inaccurate choices. In addition, consumers may perceive enhanced choice risks due to their limited control and transparency. Restricting the choice situation to verbal information and forgoing the opportunity to inspect choice options visually means that consumers are deliberately delegating some of their control. In voice commerce, decision making depends on the options presented by the voice assistant, which might be determined by vendors' promotional activities. More so than in an e-commerce setting, which allows consumers to compare product information (e.g., prices) across websites, vendors strongly determine the information being provided in voice commerce and thus influence the attractiveness of choice options.

Finally, some initial studies indicate that voice commerce, compared with other commerce formats, systematically alters consumers' choices (RQ2.3). For example, Paul *et al.* (2021) show that consumers make more indulgent choices, suggesting that they share their perceived responsibility for choices with the voice assistant, which enables them to justify the selection of options that otherwise might evoke perceived guilt. If consumers trust their voice assistant, they also exhibit stronger tendencies to choose an option presented as the default and consider a smaller set of choice options (Mari and Algesheimer, 2021). This pattern may lead to decreased price sensitivity, such that consumers rely on the suggestions of the voice assistant without closely considering alternative options themselves.

Ordering. After consumers have completed the choice step by selecting their preferred product or service, they proceed to the *ordering* step and must provide destination details for the delivery of goods or other information (e.g., invoice address). Furthermore, they may have to choose among different logistics options (e.g., providers, standard vs. express delivery). In the case of services, consumers select among different scopes (e.g., buying an

1 For conceptual parsimony, we focus on purchases made exclusively through voice commerce. In practice, consumers may use additional devices (e.g., smartphones, tablets) together with their voice assistants to make purchases. We discuss different types of voice-enriched commerce and their implications subsequently.

individual press article vs. subscribing to a service). The orders then get processed by the voice assistant, following a simple command (Mari and Algesheimer, 2021). Ordering through voice commerce promises mental relief, especially for recurring purchase decisions, for which a purchase history is available and the voice assistant can perform an automated match (Mari *et al.*, 2020). Sudden needs for a product in a particular usage setting can be satisfied directly, rather than being forgotten later (e.g., a consumer notices that the stock of dishwasher tabs is getting low and orders more immediately, by calling out to the voice assistant). Yet relatively little information gets communicated in the order stage, such that dialogues are limited, and necessary changes get communicated only in exceptional cases. Thus the ordering process is shortened and accelerated, which consumers likely find convenient. The reliability of the voice recording probably determines whether customers rely on the voice assistant for major adjustments (e.g., changing the shipping address) or prefer to make selections, or at least a final check, on a screen. Privacy concerns and trust again might arise as impediments at this point; consumers might prefer to avoid reciting their address or other private information out loud, especially in public settings (RQ2.4).

Habitual, bundled, regular purchases also could transform into fragmented purchasing behavior if organized by the voice assistant (RQ2.5). This fragmentation could lead to coordination problems in family households and be less sustainable than current purchasing behavior. For example, rather than collecting items on a shopping list and buying them altogether in a weekly purchase, the convenience of instant ordering may decoy consumers into placing quick orders for single items, resulting in multiple deliveries and potentially overlapping orders. Research should investigate the extent to which the coincidence of choice, order, and payment leads to fragmented purchasing behavior, with negative externalities.

Payment. To conclude the purchase stage and place their order, consumers need to select and confirm a *payment* method. They verbally select a payment method, by entering a new payment method or choosing from a list of preset options, then must authorize the payment for the order to proceed. Paying through voice commerce can have positive and negative implications for consumers' perceptions of and attitudes toward payment. Whereas consumers might perceive the payment process as efficient and accelerated, because it does not require them to review payment data again, the hands-free, verbally induced payment confirmation may seem risky to consumers. Feelings of discomfort might occur if privacy appears limited, such as due to the humanoid nature of voice assistants (RQ2.6).

By merging choice, order, and payment, voice commerce might cause consumers to become less price-sensitive (RQ2.7). The automatic checkout eliminates time for reflection on total costs, as is typical for online purchases, which can lead to shopping cart abandonment (Huang *et al.*, 2018; Kukar-Kinney and Close, 2010). In contrast, lower payment salience might result in greater abandonment of shopping carts, if a high value of the basket surprises voice commerce consumers. In addition, unauthorized purchases through voice commerce might occur without protective measures, which could be a challenge, especially for families. Confirming a payment through verbal commands rather than manually swiping a card or typing in payment data might feel transient and less "official." For some consumers, it likely stimulates discomfort; they worry about losing track of their expenses, which can represent a purchase barrier. But some consumers also might enjoy limited bookkeeping opportunities, even if it reduces the pain of paying and leaves them prone to exceed their budgets.

3.3. Postpurchase Stage: Voice Assistant as Relationship Partner versus Intruder

The ability to listen to consumers, understand their verbal utterances, and interact with them in natural language makes voice assistants potentially powerful customer experience partners in the postpurchase stage. As omnipresent devices with low activation thresholds, voice assistants can accompany and support consumers throughout the postpurchase stage, from the initial unboxing, to setting up, to discovering the products' functionalities, to vendor-initiated cycles of increasing engagement with the product and vendor brand. In this ways, voice assistants offer unprecedented opportunities for providers to learn more about and take an active role in customers' postpurchase usage and engagement. These new opportunities may help consumers unlock the full value potential inherent in their products, but consumers also might perceive vendors as intrusive. Therefore, we discuss the opportunities and threats of voice assistants during the postpurchase stage, along with promising avenues for research related to this final stage of the customer journey.

Extant literature on voice assistants tends to focus on their potential applications, benefits, and drawbacks in the prepurchase and purchase phases, with less consideration of their capacities for improving consumers' postpurchase experience. Among some emerging literature on voice assistants in the postpurchase phase, we find evidence of the impact of voice assistants on customer engagement at a general level (e.g., McLean *et al.*, 2021; Moriuchi, 2019). Their applications for (initial) usage phases remain largely overlooked. Table 4 includes these and other promising research avenues for the initial

usage and engagement phases, which we discuss in more detail next.

Area	Research Questions
Postpurchase Stage: Voice Assistant as Relationship Partner versus Intruder	
Initial Usage	RQ3.1: Can voice assistants facilitate **onboarding processes** for new customers? ■ Do they support continuous customer interactions after purchase? ■ How can voice assistants enable set-up, installation, and discovery of newly purchased products' features? ■ Can voice assistants compensate for reduced sensory information? RQ3.2: Can voice assistants mitigate **postpurchase dissonance**? ■ Do they reinforce confidence in purchase decisions? ■ Do they reduce customer doubts and help them cope with negative emotions?
Engagement	RQ3.3: How do voice assistants influence **brand-related engagement**? ■ What differences arise between contractual and non-contractual settings? ■ What are the effects on interaction intensity? RQ3.4: Can voice assistants improve **recovery processes**? ■ What role do verbal cues have for complaint handling? ■ Which emotions emerge when consumers complain to voice assistants? ■ Is it more likely for people to complain to voice assistants? RQ3.5: Which **customer insights** can vendors generate from voice assistant interactions? ■ Should providers engage in automated data collection during usage? ■ What are the key opportunities for proactive customer interactions? RQ3.6: How do voice assistants influence **customer loyalty**? ■ What is the role of continuous customer engagement? ■ Does brand ubiquity influence evoked sets? ■ What is the best timing for approaching customers?

Tab. 4: Research Questions on Voice Commerce in the Postpurchase Stage

Initial Usage. Despite the lack of consideration in extant literature, voice assistants offer unique and unprecedented opportunities for vendor firms to accompany consumers along their usage process and adopt an active role. In traditional commerce, vendors usually lose contact with customers once the sale is complete; the customers' consumption and product usage behavior would remain opaque to the vendor firm. Firms' passive roles and lack of insight into customers' usage processes represent particularly acute issues for vendors in indirect distribution channels, such as automobile and consumer electronics manufacturers or insurance providers. But through omnipresent voice assistants with low activation thresholds, firms can obtain instantaneous feedback from customers, send them targeted messages, and interact with them in natural ways.

Even if, as we have noted, the specific characteristics of voice assistants make them particularly well-suited for information search and for ordering low-involvement and repeat-purchase products, they might prove very helpful for navigating setup and initial usage steps for newly acquired, high-involvement products. From customers' perspective, voice assistants provide valuable support as they seek to set up, install, and learn the functionalities of newly purchased products, especially if those products are particularly complex or require difficult installation. As a sympathetic ear, voice assistants represent valuable experience partners that lead customers through the setup process and accompany their first usage attempts (RQ3.1). Voice assistants would be particularly helpful if consumers' tactile or visual senses are consumed by other activities, such as when assembling furniture or installing software.

Certain target groups, such as elderly people or people with limited capacities, also may benefit from voice assistants that compensate for their impaired senses or skills. Generally speaking, voice assistants seem likely to gain importance as customer experience partners for consumers of increasingly complex, technology-enabled goods and services. When voice assistants provide human-like feedback, they can reinforce customers' purchase decisions and foster their motivation to try their purchased products; they also might mitigate their frus-

tration or cheer up customers who struggle to install and test newly acquired products (RQ3.2).

In terms of the specific characteristics of voice assistants, provider firms should proactively design and manage onboarding processes that lead targeted customers through the first steps of installing and using new products. Then the feedback they obtain can be used to monitor and improve the customer experience. If many consumers struggle with a particular installation step for example, vendors might encourage partners in the supply chain to simplify the process to increase customer satisfaction.

Engagement. Following the initial postpurchase setup, customers enter a phase of continuous usage of a product or service, characterized by engagement. Brand-related engagement is the "customer's behavioral manifestations that have a brand or firm focus, beyond purchase, resulting from motivational drivers" (van Doorn *et al.*, 2010, p. 254); it drives consumer–brand relationships (Malthouse *et al.*, 2013). Examples of key brand-related engagement behaviors include interactions with brand representatives (e.g., customer support channels), brand-related interactions with other consumers (e.g., word-of-mouth), and the creation of brand-related content (e.g., posting on social media). In the engagement phase, vendors aim to (1) increase interactions with customers, (2) provide support and recovery; (3) generate customer insights as well as (4) create customer loyalty and initiate repeated purchases. Voice assistants have the potential to contribute to all four of these interrelated goals.

With regard to *increasing interactions with customers*, the ubiquity of voice assistants in customers' daily lives makes repeated interactions easier and more likely. This benefit is especially relevant for vendors that do not enter into contractual agreements with customers. Contractual settings (e.g., gym membership, video streaming service) are per se characterized by repeat interactions, but in non-contractual settings, vendors risk losing contact with consumers immediately after the purchase. But voice assistants can accompany customers throughout their entire usage period (RQ3.3).

Interaction through voice-based assistants also might help address problems that arise in the postpurchase phase and allow companies to *provide support and recovery*. Social media tend to make customer complaints and vendors' recovery efforts public and visible to others (e.g., Hogreve *et al.*, 2019; Schaefers and Schamari, 2016), whereas voice assistants could give vendors an option to revert this trend and regain a greater degree of ownership over the recovery process. Personal interactions also might create more efficient and effective support, because verbal cues can automatically signal the existence of and need to recover a service failure (e.g., level of anger expressed). We posit that vendors may encounter more emotional complaints through voice assistants than through email, because speaking leads consumers to express more emotional attitudes than writing does (Berger *et al.*, 2021). In addition, the complaint barrier may seem lower with voice assistants, because talking generally is perceived as less effortful than writing. Moreover, unlike customer service channels that require waiting for an available service agent, voice assistants are always available (RQ3.4).

Customer complaints, general inquiries, and brand-related interactions through voice assistants give vendors more *customer insights*, including some that are difficult to gather through other channels. When interacting with voice assistants, customers might directly and freely share their product experiences, ideas for new products, or responses to market tests (RQ3.5). However, vendors should leverage this possibility with caution, because surveying customers too often can have negative effects (Dholakia *et al.*, 2010).

By continuously engaging with customers, voice assistants also offer the opportunity to *increase customer loyalty*. Brand familiarity likely increases through repeated interactions, such that the brand remains top-of-mind for customers and maintains a position in their evoked consideration set. Ultimately, the vendor's postpurchase activities aim to *initiate repeat purchases*. But a major challenge arises in terms of finding the right timing to approach customers. Voice assistants can be helpful in this sense, in that they may enable vendors to gain more nuanced understanding of customer needs and wants. Signals detected through voice-based interactions in the engagement phase also might signal situations in which customers are more open to further offers (RQ3.6).

3.4. Stage-Overarching Considerations

In addition to the stage-specific challenges of voice commerce, we identify some overarching research questions, compiled in Table 5.

Single- vs. multichannel customer journey. Thus far, we have focused on customer journeys in which all customer touchpoints involve one vendor and one channel. In reality, such simple customer journeys are rare. Instead, customers "interact with firms through myriad touch points in multiple channels and media, resulting in ... complex customer journeys" (Lemon and Verhoef, 2016, p. 69). Although several multichannel customer journeys have been identified (Herhausen *et al.*, 2019), the potential impact of voice-based channels is unclear.

Area	Research Questions
Stage-Overarching Considerations	
Single- vs. Multi-Channel Customer Journey	RQ4.1: How does voice commerce affect existing multichannel customer journeys? ■ In which conditions might voice commerce replace or complement existing channels? ■ Which stages of the customer journey are replaced or enriched by voice commerce? ■ What effect does using voice as an additional channel have on customer loyalty?
Voice Only vs. Voice-Enriched Commerce	RQ4.2: How do combinations of auditory and visual product information influence customer search behavior? ■ Does the consumer experience differ between voice-only vs. voice-enriched commerce? ■ Can voice-enriched commerce minimize the perceived disadvantages of voice commerce (e.g., insufficient product information, difficult comparison)?
Single- vs. Multitasking Situation	RQ4.3: How does multitasking affect customers' cognitive and affective responses to voice commerce? ■ Does multitasking determine the use of specific product attributes or the number of product attributes considered in product evaluations through voice commerce? ■ Do emotional responses to voice assistants vary between single and multitasking situations? RQ4.4: How does voice commerce differ across various multitasking situations? ■ Does consumer adoption of voice commerce vary in multitasking situations, depending on task distraction and task relevance? ■ Can voice commerce overwhelm consumers in certain multitasking situations, due to the level of task-induced stress?

Tab. 5: Research Questions on Stage-Overarching Considerations in Voice Commerce

As voice commerce becomes more common, we need research insights into whether customers use voice channels to substitute for some other, previously used channels, or if it becomes an added channel in an expanded customer journey (RQ 4.1). According to Verhoef *et al.* (2007), "research shopping"—that is, researching in one channel (e.g., online) and purchasing in another (e.g., offline)—is a prevalent customer behavior. Two dominant forms of research shopping are showrooming and webrooming. Showrooming describes a customer journey in which the consumer searches offline and buys online; webrooming is the opposite. As a complement, "voicerooming" could emerge as a new form of research shopping, in which voice commerce *replaces an existing channel* for product search (i.e., online, offline, or app). The customer would make use of the advantages of voice search, then switch channels for the actual purchase (e.g., to increase the transparency of the transaction details). Alternatively, voice commerce could be *added as an extra channel* to existing journeys. For example, customers might showroom by researching a product offline (e.g., IKEA store), then purchasing it online (e.g., IKEA webshop), and then call on a voice assistant in the postpurchase phase (e.g., to get suggestions for how to assemble the purchased furniture).

Voice only vs. voice-enriched commerce. We have considered voice commerce customer journeys that rely solely on auditory presentations of information. But some devices provide visual information as well, such as smartphones and smart speakers with integrated displays (e.g., Amazon's Echo Show). With regard to the specific advantages and disadvantages of voice commerce, relative to other forms of commerce, as we have presented thus far, we also posit that a combined device might allow retailers to address some of the disadvantages. For example, the number of available search attributes would increase if consumers could see the color and style of a product on a screen. More alternatives also could be presented, because the screen allows consumers to process the presented information more readily. The benefits of reduced search effort and personalization likely remain the same with these combined devices though, so voice-enriched commerce might be a promising alternative to voice-only commerce. Research should investigate how the combination of auditory and visual information influences consumers' search behavior (RQ 4.2).

Single- vs. multitasking situations. Voice commerce often involves simultaneous executions of peripheral tasks, such as driving, walking, watching TV, or cooking. The flexibility and convenience in those multitasking situations has been highlighted as a major advantage of voice commerce (Munz and Morwitz, 2019). Yet multitasking also poses inherent challenges for consumers, because it increases their cognitive load and limits their attention (Hoffmann *et al.*, 2013). This limited attention also might alter the customer journey in voice commerce, because multitasking affects both cognitive and affective customer responses (Jeong and Hwang, 2016). With regard to cog-

nitive responses, prior research indicates that multitasking encourages the use of specific product attributes, such as price, and determines the number of product attributes considered in product evaluations (Rahinel and Ahluwalia, 2015). Consumers who experience high cognitive loads tend to focus on fewer and more salient product attributes, so we expect distinct evaluations of product alternatives within voice commerce for single- versus multitasking situations. With regard to affective responses, greater cognitive loads decrease the intensity of emotional responses (Kron *et al.*, 2010). It would be interesting to determine if relational bonds with voice assistants are more likely to emerge in single- vs. multitasking situations (RQ 4.3).

The effectiveness of voice commerce also might depend on the particular multitasking situation, characterized by the level of task distraction and task relevance. First, peripheral tasks prompt different levels of task distraction from the focal task. For example, consumers' attention to voice commerce and perceived level of task-induced stress might differ if they are simultaneously performing a task with high cognitive load (e.g., driving their car) rather than one with a low cognitive load (e.g., listening to music). Second, multitasking situations vary in the extent to which the tasks aim for related or similar goals (Jeong and Hwang, 2016). In voice commerce, consumers can perform a peripheral task related to the focal task of their shopping (e.g., voice shopping for ingredients while cooking) or one that is unrelated and pursue a different goal (e.g., voice shopping for groceries while driving). It will be important to differentiate these multitasking situations in voice commerce and examine potential differences in the customer journey (RQ 4.4).

4. Conclusion

Considering the omnipresence of voice assistants in consumers' lives (Bawack *et al.*, 2021), voice commerce is gaining traction as an e-commerce format. Its unique capabilities (e.g., hearing, understanding, interacting through natural language) enable consumers to perform shopping tasks without using their tactile senses. Voice commerce has the potential to change how consumers and vendor firms interact, engage, and relate (Dellaert *et al.*, 2020; Mari and Algesheimer, 2021; Whang and Im, 2021). In this nascent research field, we put forth a customer journey–based conceptual framework that delineates how voice assistants can evoke both bright and dark side effects for consumers, throughout all stages of the customer journey. In the prepurchase stage, they can act as information curators or manipulators; in the purchase stage, they might function as shopping concierges or impediments; and in the postpurchase and usage stage, voice assistants can become trusted experience partners or hostile intruders in consumers' lives. We identify timely research questions for each customer journey stage and discuss several stage-overarching considerations. With this research agenda, we hope to spark additional academic research on the intriguing phenomenon of voice commerce and its relevant managerial and theoretical implications.

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“The more, the merrier?” – A Systematic Review of the Effects of Technology-Induced Employee Transparency on Frontline Service Employees

By Lea Kocheise*, Marion Büttgen

Technology infusion in the service encounter is profoundly altering the workplace of frontline service employees. As digitalization increasingly enables data-driven transparency of employee conduct, this paper argues for a more employee-centric approach to organizational transparency, consequently introducing technology-induced employee transparency as a refined transparency conceptualization. Further, service literature has largely neglected studying the implications of frontline technology use on frontline workers. In an effort to fill this void in organizational frontline research, this paper provides an interdisciplinary systematic literature review on technology-induced transparency and its effects on employees and their work outcomes in related fields like management, psychology, social sciences, and computer science. Reflecting on the findings, directions for future research in the service management domain are proposed.

1 Introduction

Service work is undergoing transformative changes at an unprecedented pace due to advances in technology, such as smart sensor technologies, robotics, and artificial intelligence, leading to extraordinary opportunities for (digital) innovations and value creation (Breidbach et al., 2018; Ostrom et al., 2021). Instant information sharing and the growth of big data enable actors in service organizations to better anticipate the changing consumer journey as well as customer needs, thus enabling more accurate solutions and the provision of higher value (Antons & Breidbach, 2018). However, this new service environment not only has effects on service customers, but is shifting frontline service employees’ (FLEs) jobs as service providers try to adapt to the more and more technology-infused service encounter (Huang et al., 2021).

Increased technology use in the service encounter is largely leading to alterations in the social architecture within service organizations and influencing the delivery of services due to an evolving nature of how service employees conduct their work (Ostrom et al., 2021). The use of digital tools and the associated digitalization of interactions and processes open up new opportunities for companies to analyze not only the preferences and behavior of customers or the performance of business processes, but also the behavior and productivity of their employees, as potentially every keystroke offers insights into the employees’ workplace behavior (Gierlich-Joas et al., 2020). Notice that transparency and data mining in the process of service provision is not new (Dehling et al., 2021); what is new, however, is moving the focus on examining the employee perspective instead of the organizational or customer side. As Shook et al. (2019, p. 7) point out “most companies now recognize the need for greater responsibility when it comes to the use of customer data and technology, but most have yet to pay equal attention to the ethical and responsibility issues arising from workplace data and technologies”. Thus, there appears to be a gap in understanding the consequences of this resulting greater transparency on organizational members (Parris et al., 2016). This begs for a reflection on how the increased technology use in service interactions and the resulting data-driven transparency about employee behavior and performance affect service employees and their work outcomes (Ostrom et al., 2021).

Thus far, there is little research in the field of technology-induced transparency in the workplace and its effects

Lea Kocheise is doctoral student at University of Hohenheim, Institute of Marketing & Management (570B), Schwerzstraße 42, 70599 Stuttgart, Germany, E-Mail: lea.kocheise@uni-hohenheim.de
* Corresponding Author

Marion Büttgen is Professor of Corporate Management at University of Hohenheim, Institute of Marketing & Management (570B), Schwerzstraße 42, 70599 Stuttgart, Germany, E-Mail: buettgen@uni-hohenheim.de

on employees in service literature, therefore this area offers exciting research opportunities. Moreover, in light of the growing presence of technology in the organizational frontline, scholars call for research that integrates insights from the disciplines of management, organizational behavior, and information systems with the service management domain (cf. Antons & Breidbach, 2018; Schneider & Bowen, 2019; Subramony et al., 2018), as high connectivity among these fields is crucial in practice (Breidbach et al., 2018). Yet, despite the growing interest in discussing the relationship between increasing technology use, data-driven transparency, and the implications for employees, contributions in these disciplines have accumulated in a fragmented fashion.

This article deliberately addresses this fragmentation and the requests for interdisciplinary research in this regard from a service management perspective. Throughout the paper, the focus lies on FLEs, since according to Larivière et al. (2017) particularly the service encounter is fundamentally changing within service organizations due to rapid evolutions in technology – yet, despite these technological disruptions FLEs remain important actors in service interactions, as scholars predict an even greater desire of customers to personally connect with service employees in cases of "emotionally charged" or "bad news encounters" (Rafaeli et al., 2017, p. 93). Therefore, it is valuable to revisit service encounter research – a core theme in service research – from a service technology perspective (Furrer et al., 2020) as well as an interdisciplinary employee-centric perspective (Schneider & Bowen, 2019) in order to capture new angles in the evolving service research themes.

The objective of this paper therefore is to provide a comprehensive synthesis of the existing interdisciplinary contributions on technology-induced transparency and how it affects employees and their work outcomes and to bring forward a relevant research agenda for service management research. Thereby, this paper makes several contributions to the literature. First, it offers a refined theoretical perspective on the organizational transparency construct by considering the often neglected lens of the employee as a central component. Since workplaces become increasingly technologically infused, this employee-focused transparency perspective promises a broader understanding of how technology use in the workplace and the resulting data-driven transparency of employee behavior impact employees. Based on these considerations, this paper introduces *technology-induced employee transparency* as a context-specific, supplementary aspect of the transparency construct. Second, the interdisciplinary systematic literature review identifies the most relevant streams of research regarding technology-induced transparency effects on employees' work outcomes, predominantly physiological and psychological well-being, attitudes, and workplace behaviors. The findings underline the proposition that technology-induced employee transparency is far from being a neutral instrument. Rather, technology and the resulting data-driven transparency influence power dynamics, work outcomes like privacy perceptions, organizational commitment, or job satisfaction, and cause behavioral adaptions with potential repercussions for the organization. Third, by deducing pertinent research questions from these findings, the proposed research agenda paves the way to advance service management research with updated lenses on transparency and service encounter scholarship.

2 Conceptual Background

2.1 Technology Infusion in the Service Encounter

Traditionally, the service encounter was defined as "personal interactions between customers and employees" (Bitner et al., 1990, p. 72) or "a game between persons" (Bowen, 2016, p. 5), limiting the encounter to the dyadic, interpersonal element in the service organization-customer interface (Singh et al., 2017). However, aiming at facilitating value creation in the service encounter while reducing costs in human resource management (Rust & Huang, 2014), digitalization and a rising role of technology in the organizational frontline have radically changed the nature of service and profoundly altered customer-FLE interactions over the last decades (De Keyser et al., 2019). Today, a growing fraction of services is delivered through "the incorporation […] of technological elements into the customer's frontline experience" (van Doorn et al., 2017, p. 43), thus combining human and machine-based capabilities in the service encounter (Zysman et al., 2013).

As technology infusion in the service encounter not only changes the nature of service provision, but specifically and inevitably alters the workplace of FLEs (Bolton, 2020), "there is a need to reimagine what it means to be an employee" (World Economic Forum, 2018, p. 40), as they face increasingly sophisticated ICT systems (Rafaeli et al., 2017). In their work regarding the future of employment, Frey and Osborne (2017) conclude that particularly employees in service occupations will experience substantial computerization or some form of technological mediation within their routine as well as non-routine tasks, transforming how FLEs conduct their work. Through the adoption of technologies in the organizational frontline, service encounter activities are shifted into the digital space – and while being in use, technology, by nature, produces enormous streams of data not only on all processual components but also the activities of all users involved (Gierlich-Joas et al., 2020). For example, while customer relationship management (CRM) systems allow FLEs a 360° view of their customers' data

(Marinova et al., 2017), they log FLE time spent on customer calls or measure customer conversion rates per FLE; workflow management systems route tasks load-dependently per FLE, counting the number of issues closed and tracing the number of clicks as well as login and logout times into the software; tablets and smartphones may trace locations via GPS; communication tools like e-mail programs, customer chats, or organizational social media platforms store messages sent within and across organizational borders, capturing for how long the FLE interacted with colleagues or customers, and with whom exactly (Morlok et al., 2015); and as smart technologies are becoming increasingly relevant in the service provision, emerging examples entail emotionally-aware devices (e.g., as provided by Affectiva) that measure the customer's unfiltered emotional and cognitive responses, allowing the FLE to deliver an enriched service experience through aiding in displaying the appropriate emotions to the customer's feelings (Huang & Rust, 2017).

As potentially every keystroke is logged (Tursunbayeva et al., 2018), this data at a micro-activity level offers insights into intermediate and individual processes that previously were a black box (Bernstein, 2017). This massive amount of data on the technology user is generated as a by-product of technology use, nonetheless being accessible for potential analysis regarding productivity or workplace behavior at any later date (Morlok et al., 2015). Thus, technology in the service encounter is a novel enabler of organizational transparency (Bernstein, 2017).

2.2 Transparency in the Technology-Infused Workplace

2.2.1 Defining and Conceptualizing Organizational Transparency

The term "transparency" has come to have many different meanings. In the realm of management and organization theory, depictions of organizational transparency range from monitoring, i.e., a "non-hierarchical observation system that gathers information about an activity or a task and makes it widely available" (Bernstein, 2017, p. 3), surveillance, i.e., constant and close managerial observation of workers (Sewell & Barker, 2006), process visibility, i.e., the focus lies on making workflows comprehensible for the observer rather than individual conduct (Nussbaumer et al., 2012), to the more general understanding of transparency as the act of information disclosure, i.e., making new or previously secret information known (Berglund, 2014). Ultimately, in some form or another, most scholars incorporate the rationale of purposeful information disclosure and attributes like awareness, reliability, consistency, or understandability in reference to the quality of the disclosed information in their respective definition (Bernstein, 2017). Subsuming this consensus and these theoretical properties found in extant transparency research, Schnackenberg et al. (2021, p. 1630) define organizational transparency as "the perceived quality of intentionally shared information from a sender". Transparency literature thereby examines organizational transparency under the objectives of intentionally making "trustworthy information available to produce clarity, insight, and effectiveness, and to eliminate what is dark and secret" (Albu & Flyverbom, 2019, p. 275). This predominant perspective assumes that the active and intentional disclosure of accurate information by an organizational entity or member (i.e., a sender) provides organizational stakeholders with means to verify authentic realities and particular states of affairs, which – as a result – lead to higher efficiency, effectiveness as well as trust (Bernstein, 2017; Parris et al., 2016).

However, Bernstein (2017) notes that these conceptualizations of organizational transparency view transparency from the perspective of the observer rather than of the observed. To date, a large majority of conceptualizations and empirical studies examine the observer's agency (e.g., an organization aiming for improved performance through deliberate information disclosure to its workforce; through disclosing monitored processes and/or performance; etc.), thereby innately assuming that transparency as "information dissemination […] causes no changes in what it seeks to make visible" (Albu & Flyverbom, 2019, p. 274). Yet, increasingly scholars are questioning this assumption, as a growing body of literature suggests that the more transparency within the organization, the more opacity and secrecy efforts by the observed occur (cf. Hood & Heald, 2006). For example, organizational actors used several tactics such as lying, boasting, or behavioral matching in order to convey a favorable self-presentation to the organization if transparency efforts increased (cf. Giacalone & Rosenfeld, 2013). Transparency may thus lead to new organizational realities or conflicts due to changed conduct by the observed if the social process, tensions, and consequences of transparency for the observed (i.e., the employee) are not considered (Albu & Flyverbom, 2019). Albu and Flyverbom therefore argue for not solely focusing on the operational transmission of information and the transparency benefits for the observer through intentional disclosure, but understanding organizational transparency as a social process as this perspective provides "a valuable starting point for thinking differently about what happens when organizations disclose information" (2019, p. 277).

2.2.2 Introducing a Refined Transparency Conceptualization: Technology-Induced Employee Transparency

"Transparency is not only transforming workplaces, it is also transforming research on workplaces" (Bernstein,

2017, p. 70). Bernstein's statement captures what the previous section unraveled: not only do we need to shift the perspective applied to organizational transparency more toward the employee as the traditionally observed at the workplace, but we also need to reshape long-standing organizational constructs that have predominantly been applied in scholarly work. Digital technologies that are "mobile, dispersed, interconnected, and transcending the borders and boundaries of institutional spaces" (Manley & Williams, 2022, p. 695) have radically transformed our contemporary understanding of information dissemination to increasingly rely on advanced algorithms or system-generated data to expose "objective truths" or to create meaning. Further, the now-common use of various technologies in the workplace substantially raises the amount of data being processed, directly or indirectly generating transparency about the workplace conduct of their user, making employees potentially the object rather than the recipient of transparency. In response to the added complexity of technology infusion in (service) organizations, it is crucial to refine the construct of organizational transparency by focusing on context-specific (i.e., digital workplace) conditions and centering on the employee as subject-matter of transparency. In an attempt to reflect and synthesize the considerations of the previous sections, this paper thus offers a specification of the organizational transparency construct, which can be aggregated under the novel term *technology-induced employee transparency*:

We define technology-induced employee transparency as an increasingly emerging, specific type of organizational transparency, referring to insights into employee conduct at a micro-activity level based on intentionally or unintentionally generated data through employees' technology use at the workplace.

This definition synthesizes a number of aspects that scholars already witness. First, this specific type of organizational transparency is technology-induced and exclusively data-driven, being enabled by the adoption of technologies at the workplace (Bernstein, 2017), such as frontline technologies in service encounters. Second, while being in use, the technology automatically produces streams of data by logging activities. The generation of the employee-related data thereby is discreet and – in extension to the established definition of organizational transparency – may be intentional as well as unintentional, continuous or intermittent by nature of how digital devices and software are designed (Bernstein, 2017). Consequently, this gathering of data, both on the user's activities as well as the processes' performance (Gierlich-Joas et al., 2020), may be done in a more passive and all-encompassing manner than previously – and it is inevitable in an increasingly digitalized work environment (Bennis, 2013). Third, this data provides behavioral and physiological information on the employee by logging potentially every keystroke of how the employee navigates through the technology (Tursunbayeva et al., 2018), making task productivity, performance, and general workplace conduct accessible, analyzable, and visible (Antons & Breidbach, 2018; Ravid et al., 2022). Lastly, contrary to Schnackenberg et al.'s (2021) transparency conceptualization, technology-induced employee transparency does not per definition entail quality as a transparency characteristic, as transparency efforts may elicit changes in employee behavior (cf. Hood & Heald, 2006), consequently contorting organizational realities instead of producing trustworthy information and clear insights.

3 Systematic Review: How Technology-Induced Employee Transparency Affects Employees

"The societal implications of new technology with its accompanying deluge of data" (Bolton, 2020, p. 281) remain understudied, particularly in service management research. Therefore, the following systematic review takes on an interdisciplinary approach to synthesize studied technology-induced transparency effects on employees and work outcomes; in reflection of the findings, suggestions for future directions of research regarding implications for FLEs are proposed.

3.1 Research Methodology

To build a comprehensive literature sample, papers were collected from the Scopus database, one of the most widely used sources due to its broad coverage of scientific literature (Zupic & Čater, 2015). The initial search was undertaken using the keywords: "employee*" OR "workplace" AND "transparen*" OR "surveillance" OR "monitoring" OR "information disclosure" AND "digital" OR "technology". The keyword search was conducted in "titles, abstracts, and keywords" of publications written in English within the following subject areas: Business, Management, and Accounting; Computer Science; Psychology; and Social Sciences. Since research regarding transparency effects of technology use at the workplace is an emerging topic, journal articles may be sparse, nonetheless knowledge accumulating via other outlets. Therefore, the search was not limited to journals but also included conference proceedings. Predominantly within computer science, conference proceedings are a favored and rapid vehicle for the dissemination of research (Kochetkov et al., 2020); further, including conference proceedings avoids potential publication bias as recent articles may not have gone through the entire publication process yet (Cortellazzo et al., 2019). Non-academic publications as well as grey literature were deemed outside the study scope. These selection criteria resulted in an initial sample of 1,423 peer-reviewed articles.

Next, assuming that highly-ranked journals publish high quality papers (Paul et al., 2021), articles not appearing within the top 200 journals of the Scimago list within each subject area were discarded. To ensure scientific rigor in the conference proceedings, papers were only kept if they had at least one citation or – in order to avoid citation-based discrimination against recent publications – were published from 2017 onwards. Following, the abstracts of the remaining 619 journal articles and conference proceedings were scanned and filtered based on the following boundary conditions: (1) there was a clear reference to employees engaging with or being exposed to technologies at the workplace; (2) there was a clear link between technology use and the generation of employee data or transparency; (3) the paper explicitly explored implications for employees due to data or transparency. Articles that focused on technological specifications of monitoring tools or the implementation of novel technologies only were excluded, as well as conceptualizations of data privacy frameworks, or studies examining transparency in non-employee contexts like patient or consumer monitoring. The application of these boundary conditions resulted in a final dataset of 35 articles, comprised of 24 peer-reviewed papers published by 21 journals and 11 conference proceedings.

3.2 Results and Directions for Future Research

Iterative examination and coding of the relevant articles revealed the three following major themes of technology-induced employee transparency effects: (1) influence on attitudes, (2) influence on workplace behaviors, and (3) influence on physiological and psychological well-being (see *Tab. 1*). These major themes and their subcategories will be described in detail in the following, concluded by relevant research questions for the service management domain. Further, consequential overarching research questions that arise from the collectivity of the three themes are deduced and briefly discussed.

Major Theme	Subcategory	Source	Exemplary Service Management Research Questions	
Influence on attitudes	Feelings of privacy invasion	Abraham et al. (2019); Alge (2001); Charbonneau and Doberstein (2020); McNall and Stanton (2011); Mathur et al. (2015); Ravid et al. (2022); Sahqani and Turchet (2021); Tolsdorf and Dehling (2020); Tomczak et al. (2018); Zweig and Webster (2002)	RQ1	How does technology-induced employee transparency affect FLEs' attitudes toward the organization or their supervisor and which boundary conditions determine whether these effects are desirable or undesirable?
	Perceptions of relations of power	Aizenberg and van den Hoven (2020); Bakewell et al. (2018); Berendt (2017); Carrigan et al. (2021); Da Vieira Cunha and Carugati (2013); Kristiansen et al. (2018); McNall and Stanton (2011); Manley and Williams (2022); Mathur et al. (2015); Ravid et al. (2022); Sahqani and Turchet (2021); Sarpong and Rees (2014); Tomczak et al. (2018)	RQ2	How can service organizations enhance FLEs' trust in technologies and captured data of the technology-infused service encounter?
	Transparency acceptance	Abraham et al. (2019); Bakewell et al. (2018); Jandl et al. (2021); Mathur et al. (2015); Rafnsdóttir and Gudmundsdottir (2011); Ravid et al. (2020; 2022); Samaranayake and Gamage (2012); Sarpong and Rees (2014); Zitz et al. (2021)		
Influence on workplace behaviors	Productivity and performance behavior	Bakewell et al. (2018); George (1996); Manley and Williams (2022); Mathur et al. (2015); Pierce et al. (2015); Ravid et al. (2022); Sarpong and Rees (2014); Tomczak et al. (2018)	RQ3	Which mechanisms (e.g., increased managerial and customer attention) do explain behavioral modifications in more transparent work environments?
	System circumnavigation, anticipatory system conformity, and impression management practices	Aizenberg and van den Hoven (2020); Anteby and Chan (2018); Bakewell et al. (2018); Button et al. (2003); Da Vieira Cunha and Carugati (2009, 2011, 2013); Kristiansen et al. (2018); Leclercq-Vandelannoitte (2017); Manley and Williams (2022); Newlands (2021); Ravid et al. (2022); Spitzmüller and Stanton (2006)	RQ4	To what extent do organization-internal impression management practices and CWBs influence the service provision and perceived service quality by the customer?
	Counterproductive work behaviors (CWBs)	Berendt (2017); Leclercq-Vandelannoitte (2017); Ravid et al. (2022); Tomczak et al. (2018)		

Major Theme	Subcategory	Source	Exemplary Service Management Research Questions
Influence on physiological and psychological well-being	Physiological stress and strain	Barber and Santuzzi (2015); Camarena and Fusi (2022); Leclercq-Vandelannoitte (2017); Manley and Williams (2022); Rafnsdóttir and Gudmundsdottir (2011); Ravid et al. (2022); Tomczak et al. (2018)	RQ5 Do FLEs perceive increased pressure for performance, availability, and responsiveness when using frontline technologies, and if so, how does this influence their ability to psychologically detach after work or during break times? Which conditions (e.g., pressure from managers, peers, customers) amplify or mitigate these effects?
	Psychological inability to disconnect from work	Barber and Santuzzi (2015); Leclercq-Vandelannoitte (2017); Manley and Williams (2022)	
Consequential overarching research questions	Leadership	RQ6 In what way do existing concepts of (digital) leadership need to be reshaped to address the tensions in the relationship between leaders and their employees due to technology-induced employee transparency?	
	Learning and development	RQ7 Which transparency elements may influence the adoption, application, and enforcement of monitoring tools aimed at learning and development?	
		RQ8 How does data-driven transparency for developmental purposes moderate the effects of transparency on work outcomes such as feelings of privacy invasion, performance, or stress?	
	Coping	RQ9 Which coping strategies do FLEs undertake to handle digital service encounters and corresponding transparency?	
		RQ10 How do these coping actions impact the FLE-customer relationship and the quality of service provided to the customer?	
	Contextual factors and boundary conditions	RQ11 How do individual differences (e.g., personality traits, intelligence, age, experience with technology, qualification level) influence perceptions of technology-induced employee transparency and work outcomes?	
		RQ12 Are the effects of technology-induced employee transparency on FLEs different when the potential observer is an external stakeholder (e.g., customer, public) instead of an internal one (e.g., supervisor, peer)?	

Tab. 1: Effects of technology-induced employee transparency on employees and future research directions

3.2.1 Influence on Attitudes

The literature review disclosed that acceptance and aversion of amplified technology use and the resulting transparency effects on attitudes greatly depend on the perceived invasiveness (i.e., the intrusion and constriction by the technology of personal privacy expectations and autonomy) of the deployed technology. Several studies underscore that the more invasive a technology is perceived, the more is the technology associated with negative attitudes toward technology-induced employee transparency (Mathur et al., 2015; Ravid et al., 2022; Tomczak et al., 2018).

Perhaps unsurprisingly, the gathering of person-targeted information such as social exchanges, performance, or location monitoring is particularly likely to violate perceived privacy expectations (Ravid et al., 2022). Permanent data storage (Tolsdorf & Dehling, 2020) and active synchronous monitoring of workplace conduct (e.g., real-time internet usage, computer keystrokes) elicit more feelings of privacy invasion than passive asynchronous monitoring like e-mail scanning (Tomczak et al., 2018).

Workplace transparency also has consequences for perceptions of relations of power and influence (Carrigan et al., 2021). The review exposes a multitude of increased negative sentiments toward management such as distrust in the technologies adopted by management and suspicion in the motives for using these tools (Manley & Williams, 2022), feelings of informational unfairness and an imbalance in the information exchange between managers and employees (Tomczak et al., 2018), general concern and skepticism regarding how the organization and supervisors are ensuring data quality and interpreting the data (Sahqani & Turchet, 2021), and an increased salience toward how decisions are made by management (Berendt, 2017). Further, as Kristiansen et al. (2018, p. 9) conclude, employees feel that data is "setting the stage to shift accountability burdens from companies down to individual employees", as micro-level transparency and traceability of individual attitudes and behaviors become possible.

Despite technology-induced employee transparency eliciting largely negative sentiments, it is not rejected by employees per se. Studying perceptions regarding employee (location) tracking in logistics, Jandl et al. (2021) found that employee monitoring was starkly opposed unless workers felt that it would significantly increase work safety of hazardous work environments

(e.g., through tracing individual evacuation in emergencies). Similarly, Ravid et al. (2020) refer to call center workers where individuals expressed comfort in knowing that calls were recorded as protection against customer complaints. In these instances, employees feel more guarded than monitored, potentially as the perceived benefit of safety outweighs the cost of giving up privacy and autonomy. Further, studies indicate that data disclosure is viewed more positively as long as it serves employees to increase flexibility, work efficiency, and the coordination of tasks (Abraham et al., 2019); workers then state a sense of control over the job and a feeling of comfort in anticipating the upcoming challenges (Bakewell et al., 2018). Overall, scholars consent that acceptance of data collection is higher if the organization clearly communicates which data is collected and for which purpose (cf. Ravid et al., 2022) – yet, as soon as the purpose of data collection is perceived to explicitly capture personal information like individual performance or health metrics, the initial acceptance shifts to feelings of privacy invasion.

Turning to organizational frontline research, Schneider and Bowen (2019, p. 4) condemn that "employee experience on the frontline is relatively underemphasized in the extant service literature" despite being of key relevance in many service-related issues. For example, FLE reactions to and perceptions of frontline technologies can considerably influence the service climate, which may affect the customer perception of the organizational frontline (Schneider & Bowen, 2019). Thus, we propose the following research questions:

RQ1 How does technology-induced employee transparency affect FLEs' attitudes toward the organization or their supervisor and which boundary conditions determine whether these effects are desirable or undesirable?

RQ2 How can service organizations enhance FLEs' trust in technologies and captured data of the technology-infused service encounter?

3.2.2 Influence on Workplace Behaviors

Greater workplace transparency or data-driven employee monitoring measures are often implemented with the aim of predicting worker behavior or managing performance and outputs (Sarpong & Rees, 2014). However, the results at hand reveal that driving transparency efforts for improving productive behavior and performance seems to be a double-edged sword. Although respondents in several studies like the idea of having the possibility of comparing themselves to their peers, the monitoring and disclosing of performance data only occasionally result in gains in productivity and employee performance (Mathur et al., 2015). Bakewell et al. (2018) maintain that some employees use this access to colleagues' datasets for informal support sharing and collaborative troubleshooting, thereby slightly increasing productivity. This partly positive outcome of performance of some employees may be associated with Tomczak et al.'s (2018) finding of increases in performance and productivity for higher-skilled workers – due to them seeing electronic performance monitoring as a way to demonstrate their worth to the organization – and suffering outcomes for lower-skilled workers if they are aware of being watched. Additionally, an exhaustive mode of workplace transparency and a culture led by analytics causes performance fatigue among employees in the long run (Manley & Williams, 2022). In sum, this variety of findings largely deviates from the conventional wisdom that performance transparency increases productivity and the motivation to perform.

As illustrated, data-driven transparency and monitoring technologies may trigger negative attitudes; fittingly, a great number of studies illustrate how workers circumnavigate, manipulate, or even resist technologies that are felt to be burdensome or invasive. Notably, an overall focus of organizations on data and quantification inevitably leads to enhanced visibility, enticing employees to regulate their behaviors "in a manner that would conform with the algorithm's conception of a 'good employee'" (Aizenberg & van den Hoven, 2020, 7). Employees engage in two ways to "game the system": first, impression management, i.e., presenting a more favorable image of oneself through data manipulation for either representation purposes or additionally obtaining more profitable work (Newlands, 2021; Ravid et al., 2022); or second, anticipatory system conformity, i.e., ensuring compliance to the system's formal processes and focusing on ways to make data situationally meaningful for the observer (Kristiansen et al., 2018). Interestingly, not only employees directly working in the system alter actions for personal gains, but also managers at all levels as Da Vieira Cunha (2013) uncovered. Sales managers exploitatively used techniques to omit or improve their team's performance data in order to produce an idealized version of their achievements as leaders rather than coping with the threat of unflattering performance data (Da Vieira Cunha, 2013). Further, managers focused their managerial practices on monitoring their salespeople's reported sales in the system, enforcing and rewarding system compliance, and advising salespeople in how to hit revenue targets, e.g., by reporting orders that customers had placed as if they were the outcome of salespeople's effort (Da Vieira Cunha & Carugati, 2009, 2013).

Other studies present ways of employees actually circumnavigating data generation and the formal processes of technology; for example, instead of requesting support via the built-in support function in the system, performance-monitored engineers called colleagues via personal phones for assistance or used other informal

backchannels like social media in order to avoid an official log in the performance data (Bakewell et al., 2018).

More pressing issues for organizations and leaders, however, concern counterproductive work behaviors (CWBs), meaning deviant behaviors exercised by employees which may have serious repercussions for the firm. CWBs may thereby be directed at both individuals, e.g., through incivility to coworkers (Tomczak et al., 2018) or antisocial behavior and conflicts (Leclercq-Vandelannoitte, 2017), or at the organization, e.g., through stealing from work (Pierce et al., 2015), computer abuse, withholding efforts like taking longer breaks or working slowly (Ravid et al., 2022), or disclosing confidential information (Tomczak et al., 2018). As such, CWBs are clearly aimed at resisting the perceived invasiveness of the technology as well as the organizational practices regarding transparency efforts. The more employees perceive to forgo their privacy or deem a technology to be invasive, the more they engage in CWBs (Ravid et al., 2022).

Taken together, these findings highlight how employees' interpretations of transparency matter because they can shape how workers react to and behave in the face of such transparency. Existing service literature already informs us, more generally, that FLEs' experiences of their work context can influence their reactions in the service encounter: examples are the creaming of favorable customers to achieve certain incentives (Breit et al., 2021) or harmful, unauthorized acts like customer sweethearting (Ertz et al., 2022). These illicit behaviors may be reinforced by FLEs as act of personal gain or resistance in the face of technology-induced employee transparency. Thus, we propose the following research questions:

RQ3 Which mechanisms (e.g., increased managerial and customer attention) do explain behavioral modifications in more transparent work environments?

RQ4 To what extent do organization-internal impression management practices and CWBs influence the service provision and perceived service quality by the customer?

3.2.3 Influence on Physiological and Psychological Well-Being

For some time, examining the new or added workload demands of technology use on employees has been a matter of interest in the literature (Camarena & Fusi, 2022). However, employees are not only impacted through technology use itself, but the mere presence of technology, ubiquitous connectivity, and the known potential for monitoring can already lead to greater levels of physiological stress and psychological strain (Ravid et al., 2022). Regardless of monitoring characteristics, witnessed stress indicators range from increased arousal levels, fatigue, and anxiety (Ravid et al., 2022), to aggressiveness (Leclercq-Vandelannoitte, 2017), and stress-related illness (Barber & Santuzzi, 2015). A sense of fear regarding job security (Manley & Williams, 2022), peer pressure to conform (Berendt, 2017), as well as the pressure to perform due to augmented competition and rivalry among coworkers (Leclercq-Vandelannoitte, 2017) are the main psychological stimulators for stress and strain in transparency-focused work environments.

Stress and strain in the workplace not only influence performance and work outcomes, they also infringe on private life, blurring the boundaries of work. Although not required by management, salespeople observed by Leclercq-Vandelannoitte (2017, p. 147) felt the compulsion to be "always on", checking their devices often and sending e-mails anytime, revealing a perceived impossibility to disconnect from work. This constant availability and responsiveness was driven by the anxiety to perform and a striving to constantly demonstrate improved performance to supervisors and peers in an environment that heavily focused on individual performance metrics (Leclercq-Vandelannoitte, 2017). In a similar vein, Manley and Williams (2022, p. 701) maintain in their study of professional Rugby players that a culture of hyper-connectivity – intensified by the mobile nature of technologies – evokes "feelings of encroachment into the personal lives" as the players adapted their everyday habits to continuously track their weight improvements, eating habits, or workouts in order to match the coach's expectations. Thus, being constantly aware of one's dataset as well as that of others impacts personal life choices and demonstrates an inability to disconnect from the transparency and data-driven pressures of work (Manley & Williams, 2022).

These findings are relevant risks to consider when studying the changing workplace of FLEs, as interconnected frontline technologies and mobile devices provide the opportunity to work outside the organization's spatiotemporal boundaries. Simultaneously, the collection and creation of timely information is becoming an important enhancement to service provision, as, for example, call centers are using real-time analytics to match customers, calling anytime, with the appropriate agent to enhance service quality (Rafaeli et al., 2017). Taken the given insights into account, we recommend addressing the following research question:

RQ5 Do FLEs perceive increased pressure for performance, availability, and responsiveness when using frontline technologies, and if so, how does this influence their ability to psychologically detach after work or during break times? Which conditions (e.g., pressure from managers, peers, customers) amplify or mitigate these effects?

3.2.4 Consequential Overarching Research Questions

The increasing availability of data and the resulting transparency also pose challenges for leaders. The increasing

availability of employee data leads to tensions in the relationship between leaders and their followers, as the findings regarding distrust in management and regulations in behavior, sometimes even driven by managerial pressure, indicate. For leaders, increased insights into employee behavior at the workplace, and the outlook of being able to surreptitiously track employees on a granular level, may entice harnessing unethical methods, driven by the desire for total control (Gierlich-Joas et al., 2020). Further, leaders feel pressured to manage based on the data-enabled insights into employee conduct rather than using acquired or innate leadership skills, as Sarpong and Rees (2014) find. To date, existing concepts of leadership largely neglect technology-induced transparency effects on both employees and leaders (Morlok et al., 2015). Therefore, we propose to address this research gap:

RQ6 In what way do existing concepts of (digital) leadership need to be reshaped to address the tensions in the relationship between leaders and their employees due to technology-induced employee transparency?

Related to questions of leadership are learning and development. Tomczak et al. (2018) unveil that performance monitoring for learning and development purposes results in greater organizational commitment and job satisfaction, as it may communicate to employees that the organization is keen to facilitate their growth. Therefore, as perceptions and implications regarding transparency for personal growth remain largely unexplored (Tomczak et al., 2018), the following questions become pertinent:

RQ7 Which transparency elements may influence the adoption, application, and enforcement of monitoring tools aimed at learning and development?

RQ8 How does data-driven transparency for developmental purposes moderate the effects of transparency on work outcomes such as feelings of privacy invasion, performance, or stress?

Overall, the collectivity of findings indicate a number of new workplace demands placed on service employees on an everyday basis through increasingly sophisticated technologies. This creates a need for FLEs to negotiate, tolerate, and reduce these physical, mental, and cognitive challenges of technology infusion and resulting workplace transparency. Breit et al. (2021, p. 836) consider coping "a useful theoretical perspective for studying changing conditions in frontline workers' digital service encounters". However, thus far, there is little research and understanding of coping in technology-mediated service encounters (Breit et al., 2021). Therefore, we propose:

RQ9 Which coping strategies do FLEs undertake to handle digital service encounters and corresponding transparency?

RQ10 How do these coping actions impact the FLE-customer relationship and the quality of service provided to the customer?

Lastly, a number of other contextual factors and boundary conditions may influence the effects of technology-induced employee transparency on work outcomes. Thus, the following questions are further examples of research alleys that could be explored by service management scholars:

RQ11 How do individual differences (e.g., personality traits, intelligence, age, experience with technology, qualification level) influence perceptions of technology-induced employee transparency and work outcomes?

RQ12 Are the effects of technology-induced employee transparency on FLEs different when the potential observer is an external stakeholder (e.g., customer, public) instead of an internal one (e.g., supervisor, peer)?

4 Discussion

Due to digitalization and data availability, service organizations face a growing propensity for creating transparency, expanding previous boundaries (Cortellazzo et al., 2019). Notably, service management scholars have vastly explored the consequences of transparency on the service provider-customer relationship, maintaining positive effects such as higher customer satisfaction, loyalty, and trust (cf. Breidbach et al., 2018). However, as this paper manifests, there is a shortage of papers in service literature studying the perspective of the employee regarding increased transparency in the technology-infused service encounter. Consequently, guided by a systematic literature review, this paper illustrates employees' reactions to and handling of transparency-enabling technologies. Thereby, the value of thinking about technology infusion of workplaces and its transparency ramifications as a process that (re-)produces new forms of individual conduct and organizational governance are articulated, as further discussed in the following theoretical and managerial implications.

4.1 Theoretical Contributions

Given the tremendous pace at which novel technologies enter service organizations and work environments, organizational researchers are often slow in conducting studies on the technological advancements in the workplace and the psychological implications thereof (Ravid et al., 2020). Addressing this research gap in service management research, this article contributes to literature in several ways. First, it encourages scholars to rethink long-standing assumptions about organizational transparency and to not solely view it as a mode of deliberate information disclosure. Rather, it offers a refinement by introduc-

ing the conceptualization of *technology-induced employee transparency* and shifting the lens of transparency from the observer to the observed, i.e., the employee, thus warranting transparency to be studied in a way that has psychological fidelity. Second, to underline this contemporary reshaping of the organizational transparency construct, the conducted systematic review of technology-induced transparency effects on employees from service-related disciplines provides a systematic synthesis and contributes to a better understanding of how transparency may lead to unintended consequences such as negative sentiments toward management, feelings of privacy invasion, or changed behavior to present conformity with perceived performance expectations. Although in its conventional depictions transparency follows the assumption of objectivity and reflecting organizational realities and truths (Bernstein, 2017), the results of the literature review, however, show an interaction between the captured behavior and the actual behavior; meaning, by trying to technically observe the behavior of others, it can happen that we change the behavior, thus creating different organizational realities than we initially sought to inspect.

To some extent, similar effects have been witnessed throughout organizational research, the most prominent example being Elton Mayo and his studies in the late 1920s and 1930s to explain organizational productivity (commonly known as the Hawthorne Studies). The resulting Hawthorne Effect describes how psychological considerations of the observation (e.g., the mere knowledge that one is being watched) rather than labor-focused incentives (e.g., higher pay, better working conditions) may change behavior and performance (Bernstein, 2017). Similarly, Foucault assumed with his theory of the panopticon that "subjects participate in their own surveillance by internalizing the observer's gaze and adjusting their behavior as though they were endlessly watched (even when not actually observed)" (Anteby & Chan, 2018, p. 13), consequently leading to improved behavior. Although transparency and employee monitoring efforts often follow Foucault's standpoint, being undertaken as a way of enhancing organizational productivity and performance, the results at hand indicate, however, that increasing transparency in the workplace may trigger reverse effects (e.g., evoke resistance behavior by employees such as impression management or counterproductive work behaviors). These profoundly distort the organizational reality, leading to inaccurate awareness by the observer of the observed (Bernstein, 2017) and to potentially serious repercussions for the organization. Taken together, this paper adds value to several research streams and sets the stage for further theory development in the context of technology-induced employee transparency and related FLE attitudes and behaviors, as it underscores that although technology may capture workplace information automatically and unobtrusively, agents in the production of the data and transparency are people, not technology.

Third, we put forward research opportunities for the examination of service organizations' impact on transparency-induced consequences for FLEs. For example, the findings suggest that "this information-driven transparency will change the way power is derived" (Bennis, 2013, p. 635). Although, on the one hand, the review indicates negative sentiments of employees toward supervisors and perceptions of (informational) power imbalances due to primarily unidirectional technology-induced transparency, on the other hand, new power relations might arise as employees become the central agents in transparency production through technology use. While the latter may not initially be acknowledged by employees, it is a crucial factor to consider for leaders in data-driven environments, as negative behaviors may poison organizational cultures and work environments; further, the presented data in the system may be more dramaturgical than objective, leading to poor managerial decisions if taken for granted. Thus, the effectiveness of a technology depends to a certain degree on the employee's inclination to comply (Spitzmüller & Stanton, 2006). To remedy the risk of behavioral modifications by employees as acts of resistance or retaliation through circumnavigating or manipulating technologies, organizations need to rethink technology implementation processes to bridge the tensions between the promising benefits of increased transparency and the perceived lacking privacy, performance focus, or technology-induced strain. Thus, the proposed research agenda – although certainly not being exhaustive – provides a starting point for conceptual reasoning and empirically studying the social context of frontline technology use in order to form a nuanced understanding of employee needs and implications regarding technology-induced transparency, as the service encounter is becoming increasingly data-driven (Rafaeli et al., 2017).

4.2 Managerial Implications

The findings of this paper also entail several managerial implications. For example, a better coordination between functions, mainly IT and HR, can "address not only the technological but also the human, social, and ethical implications of the use of ubiquitous IT at work" (Leclercq-Vandelannoitte, 2017, p. 153). To date, HR seldomly is involved in technological decisions, yet, as workplace technology increasingly blurs organizational boundaries and ultimately impacts employees' quality of life, there is a greater need for HR to participate in workplace technology-related matters. Clear organizational standards and policies regarding managerial data

use alleviate privacy concerns (Sarpong & Rees, 2014), as well as the possibility of employees to have a voice in the technology implementation process or to even co-design data regulations (Sahqani & Turchet, 2021). This may provide employees with the sense of autonomy and control (McNall & Stanton, 2011) which they otherwise seek, for example, in counterproductive work behaviors. However, as Zweig and Webster (2002) note, focusing on technological solutions and adaptations of system characteristics alone will not suffice to reach greater acceptance – understanding employees' psychological barriers to transparency, consistently engaging in communication with them regarding concerns versus purpose of the tools may ensure the needed trust in system and organization. As communication becomes key (Alge, 2001), it can be worthwhile for organizations to invest in corresponding training programs for leaders as well as team-building measures to strengthen the leader-follower relationship.

4.3 Limitations and Implications for Future Research

Irrespective of the above contributions, there are several limitations to this paper that should be considered and overcome in future research. The first concern regards the review sample, as we drew from the Scopus database only, thus potentially missing relevant articles contained elsewhere. Second, it seems that practice – with the booming implementation of tools like electronic performance monitoring, process mining, workflow optimization and their vast opportunities regarding data-driven transparency – continues to outpace research efforts in understanding the ramifications of new technologies (Ravid et al., 2020); therefore, we recommend for future systematic reviews to extend their scope to include practitioner-focused journals like the Harvard Business Review, the Sloan Management Review, or further grey literature to gain a broader sample and potentially more practical insights. Third, although the introduced transparency refinement of technology-induced employee transparency is based on existing notions, it requires empirical evaluation to test whether its proposed characteristics are relevant and hold true in practice. Finally, this paper and the proposed research agenda explicitly focus on the technology-infused service encounter and FLEs, yet the explored effects of data-driven transparency on employees in the systematic review are based on research from multiple academic fields and uncoupled from certain employee roles or functions. Therefore, we encourage researchers to extend their research focus to other service employees as well – both in theory building and empirical analysis – to holistically understand the presented effects regarding technology-induced employee transparency both on a micro- and macro-organizational level.

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Keywords: transparency, frontline service employees, technology use, workplace data, digitalization

A systematic literature review of frontline employee influence factors

By Silvia Gliem

Service research acknowledged that frontline employees have a key role in making service better. Frontline employees have leverage on different aspects of service. In their roles as facilitators, information distributors, and value-co-creators they are, as said by their designation, at the front line with the customer. They are crucial for, among others, word of mouth, customer retention, and service recovery. Therefore, it is worth looking into the negative and positive influence factors.

The review results provide the top researched frontline employee influence factors and the correspondent research results. Researchers can draw on the pool of literature, which is provided on every factor and possible measures when designing an empirical study targeting one of the identified research gaps.

1. Introduction

Frontline employees or customer contact employees (Chebat and Kollias 2000; Hartline, Maxham and McKee 2000) are multifaceted actors in the service process (Larivière et al. 2017; Rafaeli et al. 2017). They represent their service firm, they are the interface with which service customers interact during a service encounter, and they function as guides and facilitators in service processes.

Silvia Gliem was a research assistant at Brandenburg Technical University Cottbus-Senftenberg, Chair of Organization and Corporate Governance, Erich-Weinert-Str. 1, 03046 Cottbus
Email: gliem@b-tu.de

Frontline employees are one of three actors in the service process. Service customer, service company, and frontline employees form the service triad (Carson et al. 1997).

During a service encounter, customer and frontline employee actively participate in the production of the service (Gummesson 1998; Wirtz and Ehret 2017; Nerdinger and Pundt 2018). In these "*moments of truth*" (Bitner et al. 2000, p. 139) co-creation or co-production of value (Gummesson 1998; Vargo and Lusch 2004) takes places. During these co-creation phases, things can go wrong. In other words, there are several points in a service transaction where co-destruction rather than co-creation can occur (Plé et al. 2010; Echeverri and Skålén 2011; Kashif and Zarkada 2015). For example, customers are not able to communicate their wishes correctly or forget to bring along an object or information needed for the service process. In such situations, it is the frontline employees' job to anticipate these can-go-wrong-things and in any case, cushion and guide the customers along the steps of the service process to make it as productive as possible.

Due to their link to the customer frontline employees are influential for different fields of customer relationship management such as customer retention (Singh 2000; Hennig-Thurau 2004; Ganesh 2016), or, when things go wrong for service failure tolerance (Chebat and Kollias 2000; Liao 2007; Wenchao 2009), and service recovery (Van Vaerenbergh and Orsingher 2016). Naturally, they play a role for customer perceived quality (Prentice 2013; Dhar 2015) and customer satisfaction (Jha et al. 2013; Rod et al. 2016), and are seen as one of the drivers of service productivity (Gummesson 1998; Singh 2000; Liao and Chuang 2004; Marinova et al. 2008).

Thus, improving the comprehension of what influences frontline employees in their work leads to improvements in various aspects of service. As a start, it is necessary to review what insights already exist by reviewing previous research.

So far, literature reviews in service research did not target frontline employee influence factors. Johnston (2005) reviewed six years of service literature identifying unde-

veloped research areas, e.g., service productivity research, and under-researched service sectors, e.g., business-to-business services. Lehmann and Kölling (2010) systematically reviewed literature about service productivity. Ranjan et al. (2015) conducted a review about service interaction quality. Wirtz and Jerger (2016) focus their review on research about service employees and conclude with research suggestions. These suggestions include ones for frontline employees that shall, e.g. deal with emotional exhausting work content. There are no recent literature reviews available,

However, to the best of the authors' knowledge, there are no systematic literature reviews about factors influencing frontline employees. This systematic literature review closes this gap.

The reader gets to know the top eleven factors that influence frontline employees in their work. Insights about the characteristics of the influence factors, their relationships with each other, and the specifics of the relationship are provided.

Practitioners will benefit from the presented state of the art about factors influencing frontline employees. The knowledge about the most relevant influence factors and their interrelatedness will provide them with concrete points of adjustment for improving present grievances and avoiding future drawbacks. In turn, this will result in the improvement of their frontline employees' performances or outputs and the positive influence on overall service outcomes.

For researchers, this systematic literature review provides a knowledge base on which to frame future research. Then, future research will be more focused and demand-oriented so that services anticipated of relying heavily on frontline employees' performances, gaining from research and transfer expertise to combat these problems.

In the following, the reader will learn about the role of frontline employees in service (2), the methods of conduction a systematic literature review and the actual process of doing it (3), and its results (4). The article concludes with implications and a summary (5).

2. Methods

Conducting the Systematic Literature Review

In conducting the systematic literature review, the researcher applied the approach of Kitchenham (2004), combined with the approaches of Cooper (1998) and Tranfield et al. (2003). This combination was used in a previous systematic literature review about occupational safety in services (Gliem and Klabuhn 2014).

The search was carried out in ten electronic databases presented (cf. Tab. 1). The primary target of the search were articles published in scientific journals. Only databases that offer a wide range of publications within business administration, economics, and services were selected.

The search was restricted to articles published between 1986 and 2016. By this, three decades of research were covered. It resulted in a minor contribution to the results list when the search was extended to years earlier than 1986, which was the reason to set this limit.

In defining the search terms, different notations and spellings for the term "frontline employee" were used. As the review targets the factors influencing frontline employees in their work, different terms for outcomes of a service process were employed (cf. Tab. 1).

Search Terms		No.	Database
Service Productivity	Frontline Employee	1	Business Source Premier
Service Efficiency	Frontline Employees	2	EconBiz
Service Efficacy	Front-Line Employee	3	Emerald Insight
Service Effectiveness	Front-Line Employees	4	GoogleScholar
Service Performance	Frontline Staff	5	IEEE Explore
Productivity	Front-Line Staff	6	SAGE
Efficiency		7	Science Direct
Efficacy		8	Springer Link
Effectiveness		9	Web of Science
Performance		10	Wiley Online Library

Tab. 1: Search Terms and Electronic Databases

In sum, the search resulted in 2,038 hits. Subsequently, this list of results was reduced systematically to select articles for data extraction and synthesis. Duplicate removal reduced the list down to 1,453 articles. Application of the inclusion and exclusion criteria (cf. Tab. 2) decreased the list to 155 articles.

No.	Inclusion Criteria	Description of Inclusion Criteria
1	Subject	The article's subject is service productivity in conjunction with factors influencing frontline employees.
2	Method	The research question is answered using a quantitative study that is not a meta-analysis.
3	Language	The article is written in English.
4	Time	The article was published between 1986 and 2016.

No.	Exclusion Criteria	Description of Exclusion Criteria
1	Availability	The article's full text was not accessible or available until the completion of the review.
2	Type of Publication	The article is an abstract, a summary, a book chapter, a dissertation, or written notes for an oral presentation (working papers and conference proceedings were allowed).
3	Hypotheses	The article has no clear and explicitly stated hypotheses.
4	Sample	The sample exclusively consisted of service customers rather than frontline employees.

Tab. 2: Inclusion and Exclusion Criteria

For the qualitative synthesis of data, further data were extracted: country of origin of authors, service sector, qualitative or quantitative study, predictor and outcome variables, results of hypotheses testing.

Notably, 26.4% of the final selection articles were published between 1994 and 2008 and 73.6% of the articles from 2009 until 2016.

The diversity of services is represented in the articles. The studies carried out took place in a variety of service industries (cf. Fig. 1). Twenty-seven studies collected data for their study in more than one service sector. Nearly one-third of the studies targeted frontline employees in the tourism and hospitality industry, 33 studies used data collected from financial services, and 14 studies were carried out in health care services. Tourism and hospitality, financial services, and health care services traditionally encompass many frontline employees. Furthermore, the researcher assumes that these sectors also have an intrinsic motivation to improve their service and are more open to participating in a study or a research project.

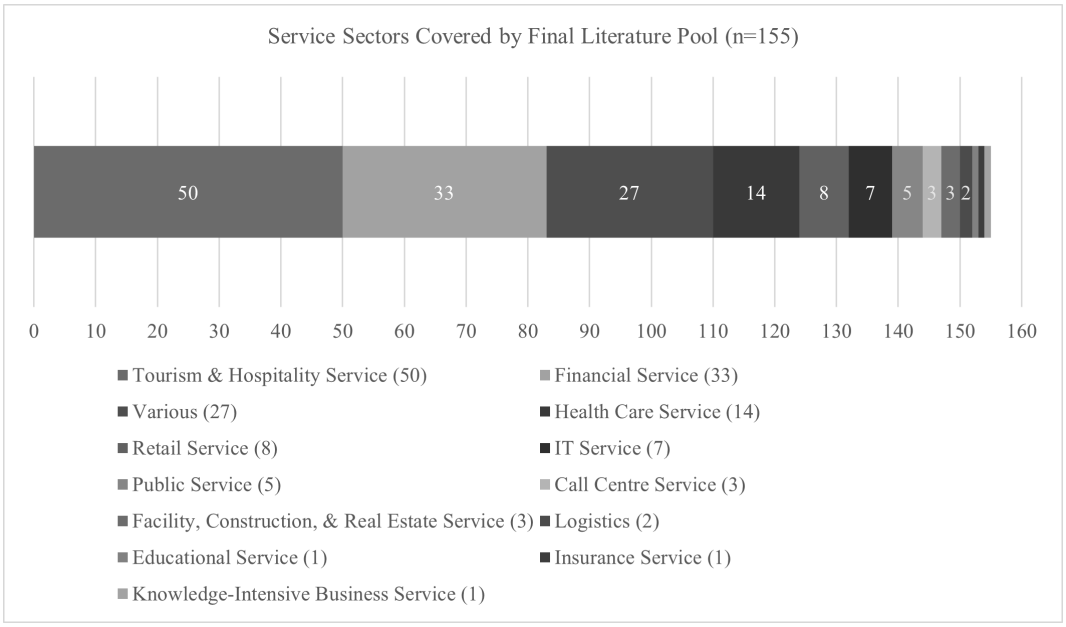

Fig. 1: Absolute Quantities of Articles in Service Sectors Covered by Final Literature Pool

The final selection of articles was published in conference proceedings, working paper series, and 62 different journals.

Regarding the articles' quality assessment, the quality of journal articles was assumed to have an appropriate level because of the review process connected with article publication in a journal. For conference proceedings (9 %, 14 articles) and working papers (3.8%, six articles), such a review process cannot be assumed. Still, both publication types were kept in the final literature pool as they represent latest research results.

The predictors and outcome variables embedded in the studies' hypotheses were extracted to achieve this systematic literature review's primary objective – finding out about the factors influencing frontline employees. The predictor variables were considered as being the influence factors. In sum, there were 312 different predictor variables. They were sorted regarding their belonging to one of the service triad actors.

As a result, 81 variables were assigned to frontline employees. To find out the most analyzed factors, the 81 factors were sorted into eight groups: 1) sociodemographic, 2) conditions or feelings, 3) character traits, 4) abilities, 5) performance variables, 6) knowledge, 7) skills, 8) attitudes. Leaving sociodemographic factors aside, it was counted in how many studies the single factors were

analyzed. The factors with the highest count were chosen as the factors being the most relevant.

Table 3 presents the eleven frontline employee influence factors and the studies they popped up. The absolute number of studies is in brackets where the factors were included as a predictor variable; studies written in italics analyzed more than one factor.

Creativity (5) Agnihotri et al. (2014); Ashill, Rod, Thirkell, & Carruthers (2009); Coelho & Sousa (2011); Van der Heijden, Schepers, Nijssen, & Ordanini (2013); Wilder, Collier, & Barnes (2014)	**Emotional Exhaustion (13)** Ashill, Rod, Thirkell, & Garruthers (2009); Ashill, Rod, & Gibbs (2015); Choi et al. (2014); Karatepe (2006); Karatepe (2011); Karatepe & Aleshinloye (2009); Karatepe & Uludag (2008); Nafees et al. (2015); Lings, Durden, Lee, & Cadogan (2014); Walters & Raybould (2007); Yavas, Babakus, & Karatepe (2013); Yoo, Kim, & Lee (2015); Zhao et al. (2014)	**Organizational Commitment (16)** Ashill, Carruthers, & Krisjanous (2006); Ashill, Rod, Carruthers (2008); Boshoff & Allen (2000); Gibbs & Ashill (2013); Guerra & Sepulveda (2014); Han, Liu, & Dai (2010); Karatepe & Kilic (2007); Lages & Piercy (2012), Malhotra, Mukherjee, & Gilliland (2010); Noor et al. (2010); Parish, Berry, & Lam (2008); Rod & Ashill (2010); Sergeant & Frenkel (2000); Singh (2000); Walsh et al. (2015); Yavas, Karatepe, Avci, &Tekinkus (2003)	Gwinner, Bitner, Brown, & Kumar (2005); Karatepe & Olugbade (2009); Karatepe & Sokmen (2006); Liang, Tseng, & Lee (2010); Noor et al. (2010); Pimpakorn & Patterson (2010); Vandaele & Gemmel (2006)	**Stress (19)** Ashill, Rod, Thirkell, & Garruthers (2009); Ashill, Rod, & Gibbs (2015); Babin & Boles (1996); Boshoff & Allen (2000); Cano & Sams (2009); Chebat & Kollias (2000); Coelho, Augusto, & Lages (2011); Karatepe (2006); Karatepe, Yavas, Babakus, & Avci (2006); Karatepe & Uludag (2008); Lings, Durden, Lee, & Cadogan (2014); Parish et al. (2008); Rigopoulou, Theodosiou, Katsikea, & Perdikis (2012); Rod, Ashill, & Carruthers (2008); Schwepker & Hartline (2005); Singh (2000); Whiting, Donthu, & Baker (2011); Yavas, Karatepe, Avci, &Tekinkus (2003); Zhou, Yong, & Danling (2014)
Customer Orientation (14) Acar, Zehir, Özgenel, & Özşahin (2013); Agnihotri et al. (2014); Babakus, Yavas, & Ashill (2009); Choi et al. (2014); Coelho & Sousa (2011); Gountas, Gountas, & Mavondo (2014); Harris, Brown, Mowen, & Artis (2014); Korschun, Bhattacharya, & Swain (2014); Lages & Piercy (2012); Lee (2014); Liaw, Chi, & Chuang (2010); Prentice & King (2011); Vandaele & Gemmel (2006); Walsh et al. (2015)	**Knowledge (4)** Agnihotri et al. (2014); Gwinner, Bitner, Brown, & Kumar (2005); Van der Heijden, Schepers, Nijssen, & Ordanini (2013); Wang, Teo, & Watson (2010)		**Service Orientation (5)** Aryee, Walumbwa, Seidu, & Otaye (2016); Guerra & Sepulveda (2014); Gwinner, Bitner, Brown, & Kumar (2005); Liang, Tseng, & Lee (2010); Vandaele & Gemmel (2006)	
	Motivation (8) Chan & Lam (2011); Coelho, Augusto, & Lages (2011); Hosain (2014); Karatepe (2006); Karatepe & Aleshinloye (2009); Masoud & Hmeidan (2013); Noor et al. (2010); Rigopoulou, Theodosiou, Katsikea, & Perdikis (2012)	**Self-Efficacy (8)** Aryee, Walumbwa, Seidu, & Otaye (2016); Chebat & Kollias (2000); Coelho & Sousa (2011); Gountas, Gountas, & Mavondo (2014); Guerra & Sepulveda (2014)	**Service Recovery Performance (7)** Boshoff & Allen (2000); García, Varela, & Río (2011); Karatepe (2006); Karatepe & Sokmen (2006); Van der Heijden, Schepers, Nijssen, & Ordanini (2013); Yavas, Karatepe, Avci, &Tekinkus (2003)	**Teamwork (5)** Arndt et al. (2011); Boshoff & Allen (2000); Mahtab (2015); Vandaele & Gemmel (2006); Yavas, Karatepe, Avci, & Tekinkus (2003)

Tab. 3: Eleven Top Frontline Employee Influence Factors Extracted from Previous Empirical Research

Using the Results of the Systematic Literature Review

To find a way through the influence factor jungle, it was considered helpful to form groups of factors that connect to a certain aspect of the frontline employee. Thus, the factors are divided into person-related factors, organization-related factors, and service-related factors (cf. Tab. 4). Person-related influence factors are in the frontline employees' scope of influence and, at the same time, not to consider separately from their workplace. Person-related factors are creativity, knowledge, and self-efficacy. Organization-related factors contain influence factors of which other organization members or the organization itself shapes a significant proportion. Organization-related factors are emotional exhaustion, motivation, organizational commitment, stress (role conflict, role ambiguity, role overload), and teamwork. Service-related factors include influence factors that play a principal role in service and can indicate its excellence.

Frontline Employee Influence Factors	Description
Person-Related Factors	
Creativity	Creativity is needed to create a new service, adapt an existent service offering, service delivery, or react to unanticipated events during the service process.
Knowledge	Knowledge is essential for frontline employees to react to different stakeholder demands, especially superiors, peers, and customers.
Self-Efficacy	Self-efficacy describes one's expectations about oneself to manage, e.g., the interaction with the service customer according to the demands of superiors, customers, and other stakeholders, which may change over time.
Organization-Related Factors	
Emotional Exhaustion	Emotional exhaustion depicts the condition when frontline employees can no longer respond to the customer adequately from a psychological point of view because the requested demands are higher than the time and effort at their disposal.
Motivation	Motivation conceptualizes the level of effort one puts into achieving a particular goal via specific behaviors.
Organizational Commitment	Organizational commitment involves frontline employees' congruence with the service firms' values and goals and the degree to which frontline employees are willing to put effort into their work for the service company and stay in the company.
Stress (Role Ambiguity, Role Conflict, Role Overload)	Stress is defined to consist of three role stressors: role ambiguity, role conflict, and role overload. Frontline employees experience role conflict when conflicting demands are directed at them, not knowing how to deal with this conflict appropriately. Role ambiguity develops when there is insecurity about how to behave in compliance with, e.g., the service company's regulations, competencies, or superiors' expectations. Role overload describes when the resources to fulfill one's role are insufficient, e.g., insufficient time to answer customer requests.
Teamwork	Teamwork denotes the degree of unity, integrity, and conformity to employees working together to achieve a common goal.
Service-Related Factors	
Customer Orientation	Customer orientation describes to which degree frontline employees can go with service customers' demands and individual characteristics.
Service Orientation	Service orientation is to which degree frontline employees see themselves as providers of a service and may indicate how helpful, empathetic, solution-oriented they are.
Service Recovery Performance	Service recovery performance describes how good a service company and its employees are at winning back customers who have had a bad service experience.

Tab. 4: Descriptions of Frontline Employee Influence Factors

All factors, ergo person-related factors, organization-related factors, and service-related factors, will be described in three sections in the coming results part with a recurring structure. At the beginning, the factor described is defined. Then, the results of previous empirical studies selected in the systematic literature review are presented.

3. Results

3.1 Person-Related Factors

Creativity

In service, creativity has different notions. For example, creativity comes into play when there is a necessity to adapt a service offering or service delivery. Thus, deviating from the usual ways of how service encounters go and delivering high-quality service to customers is one side of creativity in a service context (Ashill et al. 2009; Wilder et al. 2014).

Instead, creativity can be considered an immanent component of frontline employee behavior (Agnihotri et al. 2014). Generating ideas for improvement is another notion of creativity in the service context (van der Heijden et al. 2013).

In terms of the previous research results about creativity, there is a positive influence of frontline employee's perceived creativity on frontline employee performance (Coelho and Sousa 2011; Agnihotri et al. 2014). Furthermore, high frontline employee creativity levels lead to increased customer problem-solving capabilities (Agnihotri et al. 2014). It also increases the capability to adapt a service offering (Wilder et al. 2014) – both qualities of frontline employees that are desirable and can be subsumed under a broader comprehension of a frontline employees' customer and service orientation.

There is also empirical evidence of the positive impacts of frontline employees' (quantitative) level of generated ideas for improvement, which was considered a surrogate for creativity. The generation of ideas for improvement points to *"novel responses that provide improved service delivery and solutions for failures of the products involved"* (van der Heijden et al. 2013, Tab. 1) and positively influences recovery speed and recovery quality. Additionally, the level of generated ideas for improvement moderates the relationship between recovery speed and recovery quality (van der Heijden et al. 2013).

Another surrogate for creativity is job resourcefulness, which is similar to the creativity notion of problem-solving. Ashill et al. (2009) found out that frontline employees' job resourcefulness is positively related to frontline employees' service recovery performance. It further moderated the relationships between role stressors, emotional exhaustion, depersonalization (removing oneself from the job, seeing it as necessary to do (Ashill et al. 2009), and service recovery performance.

Knowledge

Fichtel et al. (2010) report on knowledge as one of three factors shaping frontline employee behaviour besides progressiveness and communication skills. Furthermore,

it is essential for fostering frontline employees' creativity. The generation of novel ideas for different aspects of the service transaction resorts to the knowledge already there. The greater the knowledge base, the more potential for creativity (Agnihotri et al. 2014).

Knowledge also means understanding customers and, by being able to understand them, providing superior service (Gwinner et al. 2005). It is even more relevant when service customers and service providers originate from different countries and cultures. Knowledge about peculiarities that come with the customers' country of origin and the correspondent culture might improve service encounters (Fichtel et al. 2010; Yan et al. 2010).

Previous research has proven knowledge to be significantly related to the frontline employees' ability to identify with the customer (Yan et al. 2010). Again a characteristic that is assumed to be strongly related to highly customer-oriented frontline employees. Additionally, their ability to adapt their behaviour during a service transaction increases with rising customer knowledge levels (Gwinner et al. 2005). Van der Heijden et al. (2013) found a significant negative effect of frontline employees' knowledge sourcing behaviour on recovery speed. In other words, frontline employees keen on achieving a high understanding of customers' problems might delay the recovery process and extend the recovery processes' duration (van der Heijden et al. 2013).

Self-Efficacy

Being confronted with complaining customers or with service failure situations can pose a challenge to frontline employees. Self-efficacy plays an essential role in dealing with such situations (Bandura 1977). Self-efficacy *"influences people's expectations about their abilities to perform successfully in new situations"* (Jones 1986, p. 267). These expectations are subject to change, e.g., when a frontline employee accumulates experiences with the firm's service products, customers, and service failure situations, his or her self-efficacy increases (Coelho and Sousa 2011).

As said in the introductory part of this chapter, self-efficacy analysis is relevant for exploring frontline employee behaviour and its changes. Previous research considered this fact and analyzed self-efficacy as a predictor for variables representing organizational output or variables relevant to organizational output.

Increasing self-efficacy leads to higher frontline employee job satisfaction (Karatepe et al. 2006). Karatepe and Olugbade (2009) analyzed self-efficacy as an antecedent of frontline employee work engagement. They used the three-dimensional work engagement construct of Schaufeli et al. (2002), consisting of vigour, dedication, and absorption. All three dimensions show congruencies with the definition of the construct "effort" utilized by Karatepe et al. (2006, p. 549). Whereas self-efficacy was proven to be significantly positively related to frontline employee effort (Karatepe et al. 2006), only the absorption dimension of work engagement could be predicted significantly by self-efficacy (Karatepe and Olugbade 2009).

Two studies analyzed the relationship between frontline employees' self-efficacy and frontline employee performance, coming to mixed results of whether or not there is a significant positive relationship (Karatepe et al. 2006; Coelho and Sousa 2011). Another outcome variable of self-efficacy is customer orientation. In several studies, self-efficacy is positively related to customer orientation (Noor et al. 2010; Coelho and Sousa 2011; Gountas et al. 2014). The two-dimensional self-efficacy construct of Pimpakorn and Patterson (2010), which they derived from Hartline and Ferrell (1996), only shows a significant positive relationship with customer orientation in the second dimension (self-confidence towards coping with job demands and colleagues' capabilities).

3.2 Organization-Related Factors

Emotional Exhaustion

Researchers analyzed emotional exhaustion as well as exhaustion. In every case, exhaustion either coincided (Karatepe 2011) or contained emotional exhaustion as a component (Zhao et al. 2014). The focus here is on emotional exhaustion, which is one component of burnout, the other two being depersonalization and decreased personal accomplishment (Maslach and Jackson 1981).

Emotional exhaustion is the most influential burnout component and is seen as initiating burnout (Boles et al. 1997; Bakker et al. 2004).

If frontline employees feel high levels of emotional exhaustion, researchers found their service recovery performance decreasing (Ashill et al. 2009; Choi et al. 2014) with customer orientation mediating this relationship (Yoo et al. 2015). Furthermore, Choi et al. (2014) found a negative relationship between emotional exhaustion and customer orientation.

Interestingly, the negative effects of emotional exhaustion on frontline employees' job performance could not be confirmed (Karatepe and Aleshinloye 2009; Ashill et al. 2015). Instead, Karatepe and Uludag (2008) found a significant positive relationship between emotional exhaustion and job performance. They comment on two other studies where such relationships were found to be significant (Advani et al. 2005; Van Dyne et al. 2002). In line with the other two studies mentioned before, Karatepe and Uludag (2008) suspect that the fact that the frontline employees included in their sample receive tips from customers might be an explanation for their result. Advani

et al. (2005) analyzed IT professionals who work deadline-driven and might exert better performance when emotional exhaustion increases. Van Dyne et al. (2002) analyzed hair stylists and explain the surprising findings with intervening factors like personality traits and work experience that makes employees focus on their job-related tasks instead of their level of emotional exhaustion.

Motivation

Motivation reflects *"the degree to which an individual wants and chooses to engage in certain specific behaviors"* (Mitchell 1982, p. 82). Thus, service firms must uphold their employees' motivation to achieve the firm's long-lasting success (Masoud and Hmeidan 2013). There are different kinds of motivation, e.g., motivation towards a specific task, a bundle of tasks (job), or a global measure (Cadwallader et al. 2010). Furthermore, motivation can be differentiated into extrinsic and intrinsic motivation. Extrinsic motivation *"[…] arises from the desire to obtain some outcomes (such as rewards) that are apart from the work itself"* (Amabile 2001, p. 186). Intrinsic motivation in a work context originates in a feeling of satisfaction and accomplishment from the job a person is doing (Tyagi 1985). In the context of frontline employees, intrinsic motivation may be an essential factor when looking at the emotional work that has to be done by frontline employees in service encounters (Karatepe and Aleshinloye 2009).

Intrinsic motivation revealed positive and significant influences on frontline employee creativity (Coelho et al. 2011). The influence of intrinsic motivation in particular or motivation in general on frontline employees' performance produced mixed results (Rigopoulou et al. 2012; Hosain 2014).

Also, there is a positive relationship to service recovery performance (Karatepe 2006). In this line are the results of Chan and Lam (2011), who could also confirm a positive relationship between frontline employees' perceived motivation and their supervisor rated customer complaint handling behaviour. Noor et al. (2010) found a positive relationship between frontline employees' perceived motivation and perceived customer orientation. Previous research points to the positive influence of frontline employee perceived motivation on service-related factors.

Organizational Commitment

Organizational commitment comprises *"a strong belief in and acceptance of the organization's goals and values[,] a willingness to exert considerable effort on behalf of the organization[,] and a strong desire to maintain membership in the organization"* (Mowday et al. 1978, p. 4). It can also be denoted as *"feelings towards the organization"* (Rod and Ashill 2010, p. 86). In other words, if employees are highly committed to their organization, they *"feel valued, supported, and conducive to their well-being"* (Walsh et al. 2015, p. 4). Organizational commitment can be divided into three components: affective, continuous, and normative commitment (see Allen and Meyer 1990, for further definition). The three components are independent of each other. Employees can be highly affectively committed, while the other components do not have to have the same level (Allen and Meyer 1990).

Organizational commitment is essential when looking at the relationship between a frontline employee and his or her service firm (Walsh et al. 2015). As will be seen in the following elaborations, it generates positive outcomes for employees, firms, and customers.

Ashill and his peers carried out several studies in which they analyzed the outcomes of organizational commitment. The results show an unambiguously positive relationship between frontline employee perceived organizational commitment and service recovery performance (Ashill et al. 2006; Ashill et al. 2008; Rod and Ashill 2010). Furthermore, it is notable that there are no differences in public and private hospitals regarding the influence of frontline employees' perceived organizational commitment on service recovery performance. Due to different incentive structures between private and public service companies, the working climate and the corporate bond of frontline employees could be different.

Also, customer orientation increases with higher levels of frontline employees' perceived organizational commitment (Noor et al. 2010), as does the capacity to satisfy customers (Sergeant and Frenkel 2000).

Organizational commitment could not be confirmed as a significant predictor of job performance (Gibbs and Ashill 2013). Still, Han et al.'s (2010) analysis revealed a positive relationship between affective commitment and work performance.

Stress

There are two prevailing views of stress: Firstly, stress is defined as consisting of three role stressors, which are role conflict, role ambiguity, and role overload. Frontline employees experience role conflict when interests are directed at them that are not in harmony with each other and cause problems because the frontline employee is unsure about the correspondent answers to such demands (Rizzo et al. 1970). Role ambiguity develops when, e.g., a frontline employee is in a service recovery situation with a customer and is unsure about his or her competencies about the compensation he or she is allowed to offer (Rizzo et al. 1970) – especially when it is an unusual service recovery case. Role ambiguity, therefore, denotes a kind of insecurity originating in not

knowing how to respond or behave (contrary to role conflict where there is uncertainty about which behaviour is appropriate) (Jackson and Schuler 1985).

Role overload points to the *"individual's lack of personal resources needed to fulfill commitments, obligations, or requirements"* (Jackson and Schuler 1985, p. 430). The majority of the articles presented in the following used role stressors to describe stress. Mainly, the role stressors role conflict and role ambiguity are used more often than role overload. Perhaps this is because role conflict and role overload are not differentiated enough (Coverman 1989). Also, the relationship between role conflict and role overload demarcates role overload as "*a form of person-role conflict*" (Brown et al. 2005, p. 973). Role overload can lead to role conflict. Simultaneously, when there are high levels of role conflict, this does not allow to conclude that there is role overload (Coverman 1989).

The second conceptualization of stress defines it as *"a situation wherein job-related factors interact with a worker to change (i.e., disrupt or change) his or her psychological and/ or physiological condition such that the person (i.e., mind-body) is forced to deviate from normal functioning"* (Beehr and Newman 1978, pp. 669–670).

Stressed frontline employees demonstrate lower levels of job performance (Cano and Sams 2009; Rigopoulou et al. 2012; Zhou et al. 2014; Ashill et al. 2015) and service recovery performance (Yavas et al. 2003; Karatepe 2006; Rod et al. 2008).

Looking at the role stressor role conflict separately surprisingly reveals a positive impact on job performance (Babin and Boles 1996; Karatepe and Uludag 2008). Maybe this is because every time frontline employees dissolve a service encounter where they perceive high levels of role conflict, they surpass and, by this, enhance their job performance (Babin and Boles 1996; Karatepe and Uludag 2008). Furthermore, frontline jobs' nature is unavoidably connected with role conflict (Karatepe and Uludag 2008). When performance is operationalized and differentiated into performance productivity and performance quality, the results are, if significant, indicating a negative relationship between role conflict or role ambiguity and performance productivity or performance quality (Singh 2000).

Despite the positive effect of frontline employee perceived role conflict on their perceived job performance, the results for the impact of stress on frontline employees' service recovery performance were unambiguous.

Teamwork

Teamwork is the "*extent to which all employees pull together for a common goal*" (Parasuraman et al. 1991, p. 339). Furthermore, teamwork is when all employees are *"working harmoniously as a group"* (Mahtab 2015, p. 236). Teamwork is thought to create a productive work environment (Berry 1995), where employees work together to provide solutions to service customers' problems (Yavas et al. 2003).

In service encounters, one frontline employee interacts with one customer or a customer group. Sometimes, there is a service where customers interact with more than one frontline employee. For example, at car dealerships, customers interact with sales agents and then with frontline employees responsible for the finance issues (Arndt et al. 2011), making teamwork even more important. When teamwork in such a frontline employee team does not work correctly, the result might be decreased customer satisfaction, sales revenue, and by this, overall productivity (Arndt et al. 2012).

Consequently, frontline employees rely on their colleagues if they need help on an issue in which they lack expertise. Moreover, frontline personnel count on the back office colleagues' support (Boshoff and Allen 2000; Mahtab 2015). In this matter, Boshoff and Allen (2000) emphasize that service excellence results from a good value creation chain, at which front-end is the frontline employee.

In three studies (Boshoff and Allen 2000; Yavas et al. 2003; Mahtab 2015), teamwork was operationalized using the items from Parasuraman et al.'s (1991) extended service quality model. Two studies used constructs subsumed during the coding process under teamwork: internal influence behaviour (Vandaele and Gemmel 2006), cohesion, and relationship effectiveness (both Arndt et al. 2011). Therefore, the studies are not comparable. There are two studies (Yavas et al. 2003; Mahtab 2015) replicating the work of Boshoff and Allen (2000) without coming to the same conclusion.

Boshoff and Allen (2000) analyzed teamwork as a predictor of frontline employees' service recovery performance in a bank. In advance of the study, they conducted interviews with managers of the top-and middle-level. They found out that teamwork was identified as a possible factor of the working environment influencing frontline employees' service recovery performance (Boshoff and Allen 2000). However, their results could not confirm the influence of teamwork on frontline employees' service recovery performance. Furthermore, they build their model on existing evidence (Boshoff and Allen 2000).

Yavas et al. (2003) replicated the study of Boshoff and Allen (2000). As did Boshoff and Allen, Yavas et al. collected their data from frontline bank employees. In the end, they came to the same result: an influence of teamwork on frontline employees' service recovery performance could not be confirmed. They see a possible reason for this because employee training of Turkish banks

at the time the study was conducted did not include social skills such as teamwork (Yavas et al. 2003). Moreover, Turkish banks' working culture is different: superiors expect employees to follow orders; teamwork stays a thing for one's initiative and is not rewarded in any way (Yavas et al. 2003). Furthermore, frontline bank employees' are considered to be in a somewhat competitive work environment compared to other frontliners in other service industries, e.g., health care and education (Yavas et al. 2003; Gibbs and Ashill, 2013; Yavas et al. 2013).

Mahtab (2015) also replicated Boshoff and Allen's (2000) study and hypothesized a relationship between teamwork and service recovery performance. In contrast to previous studies' results (Boshoff and Allen 2000; Yavas et al. 2003), the data confirmed the relationship (Mahtab 2015). Maybe this is due to some limitations of the study that Mahtab (2015) comments on. Firstly, as a form of social desirability bias, employees showed behaviour, indicating that they kept private information relevant to the study for themselves. Therefore, it might be possible that they over-report teamwork to be good. Secondly, some employees' answers indicated their unfamiliarity with specific terms of research, which might be due to several reasons, e.g., the researcher's lack of time in elaborating them to the respondents (Mahtab 2015). Also, missing explanations and annotations for the respondents might be a reason for this.

All three studies collected data from frontline bank employees. They used the same conceptual model; the hypotheses are similar if not equal (in the case of Yavas et al. (2003), five hypotheses are equal with Boshoff and Allen's (2000) study). Nevertheless, Yavas et al. emphasize that the studies are not comparable regarding their *"cultural context and socioeconomic environment"* (Yavas et al. 2003, p. 262). This argument holds for all of the three studies. All three studies were conducted in different countries (U.S., Turkey, and Bangladesh). As indicated by the researchers, there are peculiarities in corporate culture, such as training not containing social skills and socialization such as secrecy concerning uncomfortable information about how teamwork is, that cause bias in data and therefore aggravate a comparison. Maybe this explains the positive result in Mahtab's (2015) study. As a consequence, the country of the frontline employees' origin is considered in the study as a control variable to check for country-specific peculiarities.

In contrast to the previously presented studies, Vandaele and Gemmel (2006) explicitly focused their study on business-to-business services and collected data from a security service company. As many studies about service concentrate on business-to-consumer service, their shift in focus complements service research, especially the area of business-to-business service (Vandaele and Gemmel 2006).

Vandaele and Gemmel (2006) did not analyze teamwork as such, but internal influence behaviour. Following Bettencourt and Brown (2003) and Aldrich and Herker (1977), internal influence behaviour frames employees' get-up-and-go mindset to communicate about changes and opportunities in the firms internal and external environment with its different stakeholders (customers, coworkers, superiors, and others) and their needs and interests (Vandaele and Gemmel 2006). Keeping in mind the definition introduced at the beginning of this chapter that states teamwork relates to the *"extent to which all employees pull together for a common goal"* (Parasuraman et al. 1991, p. 339), internal influence behaviour can be subsumed to the factor teamwork.

Internal influence behaviour is said to influence frontline employees' service delivery behaviour positively. Furthermore, Vandaele and Gemmel (2006) hypothesize an indirect relationship between internal influence behaviour and performance productivity and internal influence behaviour and performance quality. Their results confirm the positive influence of internal influence behaviour on frontline employees' service delivery behaviour and the indirect relationship between internal influence behaviour and performance quality. Instead of an indirect relationship with performance productivity, internal influence behaviour and performance productivity have a direct relationship (Vandaele and Gemmel 2006). In their discussion, the authors explain that in business-to-business services, customer-oriented behaviour is not comparable with its counterpart in business-to-consumer services. They state that frontline employees in business service see their customers more than employees than as customers and have more comprehension for their wants and needs (Vandaele and Gemmel 2006). Furthermore, they cite Singh's (2000) argument that performance productivity with its facts and figures is more effortless perceivable by frontline employees than performance quality (Vandaele and Gemmel 2006). Thus, frontline employees influence behaviour is more focused on productivity dimensions than on quality dimensions (Vandaele and Gemmel 2006).

In light of previous research regarding teamwork as a frontline employee influence factor, two more factors might be worthwhile checking their relationships with teamwork: customer orientation and service orientation. When thinking of frontline employees' daily work, customer orientation and service orientation are relevant variables.

3.3 Service-Related Factors

Customer Orientation

Customer orientation denotes *"an employee's tendency or predisposition to meet customer needs in an on-the-job context"*

(Brown et al. 2002, p. 111). As the interaction between service providers and service customers is essential in service, the customer orientation of frontline employees is a critical quality (Brown et al. 2002). Having highly customer-oriented frontline employees is vital for service firms (Brown et al. 2002) and one factor influencing customer perceived service quality (Harris and Ogbonna 2002).

Korschun et al. (2014) comment on the debate of how to conceptualize customer orientation. There are three ways of conceptualizing customer orientation: Firstly, customer orientation may be conceptualized as a surface-level personality trait (Brown et al. 2002; Babakus et al. 2009). Secondly, customer orientation can be seen as a *"behavioral self-regulation mechanism"* (Coelho and Sousa 2011, p. 10) or, thirdly, as employee-customer identification that is relative to the frontline employees' and customers' characteristics (Korschun et al. 2014).

Customer orientation as a surface trait is divided into two dimensions. Brown et al. (2002) follow Saxe's and Weitz' (1982) definition of customer orientation. They define one dimension of customer orientation as the extent to which an employee is convinced of meeting customers' needs. The second dimension is the extent to which an employee enjoys interacting with customers and meeting their demands (Brown et al. 2002). The conceptualization of customer orientation as a surface trait is considered more or less constant over time. In contrast, the employee-customer identification approach is liable to the frontline employee and customer characteristics that are likely to change over time and, of course, from customer to customer.

Lastly, the behavioral approach sees customer orientation as a continually changing construct that, through constant adaptations and customizations of behaviour, is laid out to satisfy customer needs and include longer-term considerations (Korschun et al. 2014). In this line, Bettencourt's and Brown's (2003) conceptualization of customer-oriented boundary-spanning behaviour is noteworthy. In their conceptualization, there are three dimensions: external representation, internal influence, and service delivery. They represent the employees' organizational commitment to insiders (internal influence) and outsiders of the organization (external representation), as well as service delivery behavior (punctuality, politeness, diligence in service encounters). Vandaele and Gemmel (2006) adopted this conceptualization. In their study, Acar et al. (2013) used a six-dimensional construct for customer orientation adopted from Berthon et al. (2004). It resulted in 24 items solely for customer orientation. A measure considered enlightening when exploring the factor of customer orientation in detail.

Customer orientation proved significant positive relationships to performance (Babakus et al. 2009; Prentice and King, 2011; Acar et al., 2013; Agnihotri et al. 2014; Korschun, Bhattacharya and Swain 2014) and performance dimensions (Vandaele and Gemmel, 2006). Furthermore, customer orientation was positively related to service quality (Lee, 2014), service delivery (Vandaele and Gemmel 2006), service recovery performance (Choi et al. 2014), and customer response ratings (Harris et al. 2014).

Co-worker support was proposed as an antecedent but did not significantly affect customer orientation (Gountas et al. 2014). A surrogate for co-worker support is teamwork.

Korschun et al. (2014) could not confirm a significant relationship between organizational identification and customer orientation. Organizational identification embodies *"that the organizational member has linked his or her organizational membership to his or her self-concept, either cognitively (e.g., feeling part of the organization; internalizing organizational values), emotionally (pride in membership), or both"* (Riketta 2005, p. 361). The definition shares elements with the concept of organizational commitment, e.g., worth of organizational membership and overlap between own and organizational values. Still, between organizational commitment and customer orientation, a positive relationship could be confirmed by Noor et al. (2010).

Service Orientation

Service orientation describes the *"disposition to be helpful, thoughtful, considerate, and cooperative"* (Hogan et al. 1984, p. 167). Cran (1994) comments on the importance of a basic level of service orientation when hiring people for frontline jobs because the possibility to learn and train service-oriented behaviour is limited and varies from employee to employee. However, if management and organizational culture claim service orientation as pivotal, this will probably positively influence frontline employees' service orientation (Liang et al. 2010).

Vandaele and Gemmel (2006) analyzed the external representation behaviour of frontline employees. It can be seen as a surrogate for frontline employees' perceived service orientation and encompasses frontline employee behaviour towards non-members of the service organization, such as customers. Like service orientation, external representation behaviour expresses behaviour following the service firms' proclaimed service culture and commitment to their service offerings (Vandaele and Gemmel 2006). Frontline employees' external representation behaviour was hypothesized to predict frontline employees' service delivery behaviour, performance productivity, and performance quality. There are positive relationships between external representation behaviour and service delivery behaviour, as well as performance pro-

ductivity. There was no significant relationship between external representation behavior and performance quality (Vandaele and Gemmel 2006). A reason for this might be that they analyzed a security service firm being a business-to-business firm. Therefore, the frontline employee contact with these business customers differs (Vandaele and Gemmel 2006) and may be limited due to the nature of the service so that performance quality is not that salient.

Two studies confirmed that the frontline employees' service orientation positively influences frontline employee service performance (Liang et al. 2010; Guerra and Sepúlveda 2014). Aryee, Walumbwa et al. (2016) looked at aggregated service orientation (unit-wise) and could confirm a positive relationship with the frontline employees' individual service quality (evaluated by a peer frontline employee) and the moderating effect of collective human capital on this relationship. Furthermore, interpersonal adaptive behaviour, frontline employees' ability to adapt *"the manner in which the service is delivered […]"* (Gwinner et al. 2005, p. 134) as well as service-offering adaptive behaviour, pointing to the frontline employees' ability to customize the service offering to the customer, are hypothesized to be positively related to frontline employees' service orientation.

However, service orientation is only positively related to service-offering adaptive behaviour but not to interpersonal adaptive behaviour. Possibly, the study context, customer service of a telecommunication firm, where the consultancy process of finding the best service offering is more important than the service delivery at that moment (Gwinner et al. 2005). Counterintuitively, frontline employees' level of service orientation seems to be negatively related to customer loyalty (Liang et al. 2010). Liang et al. (2010) argue with the work of Carson et al. (1997), who applied the balance theory to service quality. Carson et al. (1997) explain that in services where the frontline employee plays a more prominent role for the customer than the service firm, there might be situations where the customer is loyal to the frontline employee but not to the service firm. Thus, although the frontline employee exerts high service orientation levels in service encounters and the customer is satisfied, the customer might reject the service firm, which is exposed by decreasing levels of customer loyalty.

Looking at the antecedents of service orientation reveals that affective commitment as one dimension of organizational commitment in the scale of Allen and Meyer (1990), is positively related to frontline employee service orientation (Guerra and Sepúlveda 2014). Moreover, a high-performance work system, a collective term for HR practices designed to get the best out of employees' potentials, positively impacts frontline employees' service orientation (Aryee et al. 2016).

Service Recovery Performance

Rising competition in the service market and increasing transparency for customers fostered, amongst others, by the diffusion and use of ICTs, leave no doubt about the relevance of service recovery (Boshoff and Allen 2000; Rod et al. 2008). Service recovery performance describes the *"efforts made by the firm to return aggrieved customers to a state of satisfaction following a service failure"* (Boshoff and Allen, 2000, p. 63). Frontline employees are crucial for service failures and are the primary actors of service recovery (Ashill et al. 2008). Therefore, understanding which factors influence their service recovery performance is essential (Ashill et al. 2008).

Boshoff and Allen (2000), Yavas et al. (2003), and Mahtab (2015) analyzed frontline bank employees based on the same theoretical model. However, their results are not congruent. A difference traced back, amongst others, to the different cultural contexts the studies were conducted in (Yavas et al. 2003). Boshoff and Allen (2000) found out that organizational commitment is significantly related to frontline employees' perceived service recovery performance. In contrast, Yavas et al. (2003) found significant relationships between frontline employees' role ambiguity and service recovery performance. Mahtab (2015) proved that teamwork is significantly related to frontline employees' perceived service recovery performance.

Role ambiguity proved as having a significant negative relationship with frontline employees' perceived service recovery performance (Boshoff and Allen 2000; Yavas et al. 2003; Karatepe 2006; Karatepe and Sokmen 2006; Rod et al. 2008). The same holds for role conflict (Karatepe and Sokmen 2006; Rod et al. 2008). Karatepe and Sokmen (2006) report on the influence of several control variables. Firstly, they comment that female employees perceive higher role ambiguity levels because it is assumed that they struggle harder in asking for support. Simultaneously, the longer the tenure (for both genders), the lower the perceived levels of role ambiguity and role conflict. Frontline employees having experienced more recovery situations, are more professional in resolving them. Also valid for both genders is the effect of education on role ambiguity that decreases with higher levels of education, which might originate in frontline employees greater competence and knowledge in pursuing expertise when there are difficult situations for them. Although the variables gender, tenure, and educational level would have been included in the empirical study either way (in the collection of sociodemographic data). Now, previous research showed that there might be effects traceable to these control variables.

Karatepe (2006) found intrinsic motivation to be significantly positively related to frontline employees' perceived service recovery performance. Emotional exhaus-

tion exerted no significant relationship with frontline employees' perceived service recovery performance (Karatepe 2006).

4. Limitations, Implications, and Conclusions

In terms of methods, the conducted systematic literature review has four limitations on which is commented in the following.

Firstly, systematic literature reviews are conducted by several persons, e.g., Lehmann and Kölling (2010) or Ranjan et al. (2015). The word *"review"* already indicates that it should be conducted by several persons doing cross-examination of the other people's work. In this review, a cross-examination is considered reasonable for testing the search terms in the different electronic databases, the sorting of the articles, and, above all, when the inclusion and exclusion criteria' appliance did not result in a definite conclusion whether to include the article or not. In this review, the researcher did all these steps by herself including the extraction of predictor variables.

Secondly, during the data extraction and data synthesis, the researcher came across search terms not considered in the review such as "boundary-spanners" (Bettencourt and Brown 2003), "(service) frontliners" (Hau et al. 2017), or "customer-contact (service) employees" (Malhotra et al. 2010). Not including these search terms may have led to the non-consideration of relevant articles, as they were not found during the systematic search.

Thirdly, for selecting the factors influencing frontline employees, the factors were chosen that were analyzed in the highest number of articles. Thereby, the researcher implied that the factors researched the most (and published) are the most relevant. It is possible that some factors are given more weight in the studies because better metrics are available than for other factors. Data on these factors are easier to collect and are thus much more readily available and overrated in scientific and business practice. Besides, there is the publication bias, i.e. the fact that positive results or results that produce something "useful" for the general public are more likely to be written down and published (Card and Krueger 1995).

Looking at the eleven influence factors reveals the clutteredness of this research area. For researchers and practitioners alike this clutteredness poses a challenge when wanting insights about influencing factors of frontline employees. However, with this systematic literature review at hand covering three decades of research about frontline employee influence factors, there is a starting point.

This review is practical for researchers to get an overview of frontline employee influence factors. It answers which factors have been studied so far and which factors may need more attention in research.

Also, the review provides researchers a possibility for pragmatically design their own research. It provides a first pool of literature on frontline employee influence factors researched the most in the last three decades. Furthermore, by having this literature pool at hand, researchers are given measures of operationalization at hand, when designing an empirical study of their own. Having included only empirical studies in this review and the top researched factors even offers the researcher insight in which measures where used the most.

Looking, then, into the factors and previous research results uncovers gaps in research and unfolds future research avenues. First, previous research results, e.g., the positive influence of creativity on frontline employee outcome or the negative influence of emotional exhaustion on frontline employee outcome, can be confirmed. Second, a deeper dive can be taken into unclear or puzzling results, e.g., the influence of teamwork. Third, as said in the beginning of this paragraph, gaps in current research can be closed, e.g., the influence of the three different role stressors on frontline employee outcome.

Regarding frontline employee outcome specifically, it is recommended to deepen the knowledge about frontline employees' customer orientation and service orientation. In specific, it is proposed to prove the influence of creativity, the three role stressors, and teamwork.

Also, for service orientation there is a gap for the relationships of emotional exhaustion, motivation, organizational commitment, and self-efficacy that might provide further insights into a frontline employees' service orientation.

Turning to service recovery performance, which is a highly important construct, when it comes to a service company's ability to strengthen their customer relations, organizational commitment of frontline employees might be a good start to enhance it. Also, looking into a frontline employees' self-efficacy and perceived teamwork are factors worth looking into.

For practitioners, the review offers the possibility to search much more specifically for the factors that are important to them. As a result, they have measures and instruments such as the Balanced Scorecard more quickly at hand for use in their companies. At the same time, the review also shows practitioners that frontline employees as human beings are complex and that individual factors should not be considered separately. The review results showed that the eleven influence factors have interdependencies. Furthermore, it became apparent that the way in which certain factors are implemented in business practice could result in different outcome. For example, the perception of creativity and teamwork for frontline

employees is very closely linked to what is the service company's comprehension of it and how it is anchored in everyday work practice.

Summing up, in frontline employee research, loads of research about what makes frontline employees even better employees has been conducted. However, a review of it was missing. At least, for the most publicized influence factors that go together with frontline employees' performance, there is an overview now. It shows the cluttered-ness of research in this area. It aligned previous results, identified specific gaps implying research opportunities and thus giving future research more purpose and more target-orientation.

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Frontline Employees' Attitude Toward Embodied Social Robots In Customer Service: An Integrative Framework And Empirical Test

By Stéphanie Ernens, Cécile Delcourt*, Laurence Dessart, Lisa Baiwir

Embodied social robots—robots providing services for and in cocreation with consumers—are expected to profoundly change the way services are delivered. Yet, their integration in customer service poses a challenge: their adoption by frontline employees (FLEs). Accordingly, this study aims to examine FLEs' attitude toward embodied social robots and to uncover its antecedents. This work presents an integrative framework which builds upon the technology acceptance model and examines the influence of potential factors on FLEs' attitude toward embodied social robots. An online survey among 165 FLEs is used to test the integrative framework. Despite the growing knowledge regarding customers' perceptions of (embodied social) robots, the perspective of FLEs is under-investigated while crucial to foster FLEs' acceptance of such robots. This research concludes with several strategies service providers can implement to possibly enhance FLEs' attitude toward embodied social robots, and thus, to support their adoption by FLEs.

1. Introduction

The combination of robotics and rapidly improving technologies, such as artificial intelligence (AI), has the potential to radically change service industries (Wirtz *et al.*, 2018). Robotics and AI offer service providers a wide range of benefits, including cost reductions, productivity gains, increased revenues, and improved customer retention (Lu *et al.*, 2020; Schepers and Streukens, 2022). These technologies affect consumer experience and the process of service delivery (Lu *et al.*, 2019) while providing organizations with exciting opportunities for innovation (Wirtz *et al.*, 2018). Over the last decade, service robots—a technology at the interface between robotics and AI—took off in service sectors, such as retail and hospitality (Wirtz *et al.*, 2018). According to the International Federation of Robotics (2021), in 2020, the market size of service robots represented US$ 6.7 bn and has increased by 12% (IFR, 2021). Thanks to developments in 5G telecom services, wireless connectivity, and advanced AI chips, service robots are becoming increasingly appealing to businesses.

There is a wide range of service robots (Schepers and Streukens, 2022; Wirtz et al., 2018). In this study, we focus on physical robots that can perform social tasks (i.e., social robots). More specifically, we focus on 'embodied social robots'—that is autonomous robots that can interact socially with consumers and employees while

Stéphanie Ernens is a scientific collaborator at HEC Liège—Management School, University of Liège, Belgium, 14, rue Louvrex, 4000 Liège, E-Mail: Stephanie.Ernens@gmail.com

Cécile Delcourt is Professor of Marketing at HEC Liège—Management School, University of Liège, Belgium, 14, rue Louvrex, 4000 Liège, E-Mail: cecile.delcourt@uliege.be
*corresponding author

Laurence Dessart is Associate Professor of Marketing at HEC Liège—Management School, University of Liège, Belgium, 14, rue Louvrex, 4000 Liège, E-Mail: laurence.dessart@uliege.be

Lisa Baiwir is a Ph.D. student in Marketing at HEC Liège—Management School, University of Liège, Belgium, 14, rue Louvrex, 4000 Liège, E-Mail: lisa.baiwir@uliege.be

providing services for and in cocreation with consumers and employees (Blaurock *et al.*, 2022a). In frontline service settings, these are usually humanoid robots able to perform increasingly emotional-social tasks (Meyer *et al.*, 2020)—as they are developed for interaction with humans (i.e., customers and frontline employees). For service providers, introducing embodied social robots in the frontline represents an opportunity for innovation as much as a challenge: that of user acceptance (Meyer *et al.*, 2020).

To date, while the service literature heavily focuses on customer acceptance of service robots (De Keyser and Kunz, 2022), research rarely addresses the issue from the perspective of frontline employees (FLEs) (Meyer *et al.*, 2020)—resulting in a lack of crucial insight regarding their perceptions of robots at the frontline (De Keyser and Kunz, 2022; Subramony *et al.*, 2018). FLEs' acceptance of embodied social robots, however, is key to implement these in the frontline (Meyer *et al.*, 2020). Organizational changes—especially those related to technology—can lead to uncertainty and resistance from employees (Shah *et al.*, 2017). FLEs can perceive embodied social robots as threatening in their service jobs owing to concerns such as loss of autonomy (Lu *et al.*, 2020). Addressing the perspective of FLEs and understanding their acceptance of embodied social robots, therefore, represent a real research opportunity (Wirtz *et al.*, 2018)—as illustrated by De Keyser and Kunz (2022, p. 177): "several of the experts stress the need to consider the employee side to understand how human employees react to and may develop strong working relations with service robots". Thus, a better understanding of the FLE perspective would help avoid failures, both technical (e.g., software and hardware failures) or interactive (e.g., human errors, communicating failures) (Honig and Oron-Gilad, 2018), and identify strategies that could motivate FLEs to work and collaborate with robots at the frontline.

FLEs' positive attitude toward embodied social robots is key to their successful engagement with them—as, according to the theory of reasoned action, a positive attitude toward a new behavior (e.g., adopting a new service technology such as an embodied social robot) is a key antecedent of the intention to adopt the behavior, which, in turn, is a key antecedent of actual behavior (Fishbein and Ajzen, 1975). Thus, behaviors and behavioral intentions are determined by positive attitudes toward the new behavior.

Therefore, this study focuses on FLEs' attitude toward embodied social robots and its antecedents. Specifically, the present study aims to (1) examine FLEs' attitude toward embodied social robots, (2) uncover the factors influencing their attitude toward this technology, and (3) identify actions that service providers can undertake to enhance FLEs' acceptance of robots at the frontline. To achieve this goal, this paper proposes an integrative framework that explains FLEs' attitude toward embodied social robots drawing on prior research and technology acceptance models, including the technology acceptance model (Davis *et al.*, 1989), the social frontline robot acceptance model (Stock and Merkle, 2017), and the service robot acceptance model (Wirtz *et al.*, 2018).

The present paper contributes, both theoretically and managerially, to the literature on robots in customer service, with a focus on the FLE point of view. Specifically, the paper expands emerging research on employees' perceptions of technological advances, and responds to recent calls to examine FLEs' perceptions of (embodied social) robots and understand their willingness to work with such robots (De Keyser and Kunz, 2022; Lu *et al.*, 2020; Wirtz *et al.*, 2018). A few emerging studies have adopted a conceptual (e.g., Xiao and Kumar, 2021) or qualitative design (e.g., Paluch *et al.*, 2022) to uncover potential drivers of FLEs' acceptance of service robots. The present investigation builds on their findings and follows Meyer *et al.*'s (2020) recommendation to perform a quantitative study on the present topic of interest. Finally, the integrative theoretical framework—and its empirical validation—can provide managers with useful insights to enhance FLEs' adoption of embodied social robots.

From a managerial perspective, the present paper contributes to the future of service organizations in assisting technology providers and service providers when making strategic decisions regarding customer service encounter design and management. In fact, the present work deepens managers' understanding of FLEs' perceptions with the view of overcoming potential resistance in their teams. The study concludes with strategies that managers can use to prevent negative attitudes among FLEs while increasing FLEs' acceptance of embodied social robots.

2. Literature review

2.1 Embodied social robots in customer service

Wirtz *et al.* (2018) underline three design attributes of robots in service contexts: representation, anthropomorphism, and task orientation. They can be physically or virtually represented (e.g., Pepper vs. Alexa), have a humanoid or non-humanoid design (e.g., Sophia vs. Roomba cleaning robot), and perform cognitive-analytical or emotional-social tasks (e.g., an image analysis software assistant for medical diagnosis vs. reception robots). The present study focuses on embodied social–that is, physically represented humanoid robots which can perform emotional-social tasks. They are autonomous robots that can interact socially with consumers and employees while providing services for and in cocreation with consumers and employees (Blaurock *et al.*, 2022a).

Due to their innovative potential in retail and customer service (Grewal *et al*., 2017) and due to their ability to provide tangible services to customers (Wirtz *et al*., 2018), embodied social robots are increasingly used at the frontline, in a variety of service industries, such as airlines, hotels, restaurants, and retail, to perform customer services (Lu *et al*., 2019; Xiao and Kumar, 2021). In particular, they can provide personalized service to customers at negligible marginal cost (Wirtz *et al*., 2018) while keeping customers safe from being infected from viruses (Schepers and Streukens, 2022).

2.2 FLEs and social robots in services

Most research on the acceptance of (embodied social) robots in the service context focuses on the customer's perspective. As evidenced in Tab. 1, a number of recent studies have investigated users' acceptance of robots in services. In particular, this growing academic interest mainly focuses on customers' interaction with (e.g., Lu *et al*., 2020), perception of (e.g., Wirtz *et al*., 2018), and response to (e.g., Oderkerken-Schröder *et al*., 2022) robots, both in domestic (e.g., Hameed *et al*., 2016) as well as service contexts (e.g., Stock and Merkle, 2017).

In a recent article, De Keyser and Kunz (2021) systematically examined 173 individual studies on robots in services. While 89.60% of those studies focus on customers, only 5.78% (i.e., 10 individual studies) focus on employees (e.g., Henkel *et al*., 2020; Paluch *et al*., 2022) Thus, the literature digging into employee attitude toward robots—and more particular into FLEs' attitude toward embodied social robots—is still in a nascent stage. While studies have shown the managerial configurations and role structures according to which technology, such as embodied social robots, and FLEs can co-exist (Bowen, 2016; Larivière *et al*., 2017; Keating *et al*., 2018), or even sought to predict the future of human employment post-technology-adoption (Broughman and Haar, 2018; Huang and Rust, 2018; Davenport *et al*., 2020), further knowledge on how FLEs respond to (embodied) social robots remains necessary. Indeed, it is crucial to understand FLEs' attitude toward robots, as FLEs are an organization's most important asset and a source of competitive advantage (Wirtz *et al*., 2018). Technological developments transform service interactions and the role of humans who are empowered through digital devices (Keating *et al*., 2018). Consequently, FLEs need to adjust to technologies, upgrade and acquire new sets of skills (Huang and Rust, 2018; Lu *et al*., 2020), and essentially, be able to deal with technology as a new 'partner' (Larivière *et al*., 2017) to drive service quality (Xiao and Kumar, 2021).

Understanding why FLEs respond in specific ways to technology is particularly relevant, as recent studies indicate that they are affected by smart technologies and connected objects (De Keyser *et al*., 2019). According to Larivière *et al*. (2017), if employees are not ready to meet the new job requirements, their performance can decrease. The morale and productivity of FLEs may also decline due to a lack of confidence and comfort using technology-based service options (Parasuraman and Colby, 2015). The extent to which employees feel that their job could be replaced by technology is negatively related to organizational commitment and career satisfaction, and positively related to turnover intentions, cynicism, and depression (Brougham and Haar, 2018). As a result, service providers must reduce any potential adverse effects on employees (Parasuraman and Colby, 2015) as well as understand how to increase FLEs' motivations to robot usage.

Research on service robots taking the perspective of FLEs currently focuses on comparing service robots' capabilities with those of FLEs' (e.g. De Keyser and Kunz, 2022; Wirtz *et al*., 2018). Additionally, the impact of service robots on FLEs has also been investigated in the literature, suggesting enhanced productivity, opportunities for collaboration or wellbeing, but also job insecurity or loss of autonomy (Henkel *et al*., 2020; Lu *et al*., 2020). More recently, a few studies have adopted qualitative designs to explore FLEs' acceptance of service robots. Notably, five aspects of FLEs' acceptance of and resistance to service robots; i.e., loss of status, tension, required commitment, role incongruency, and advocation, were highlighted by Meyer and colleagues (2020). Further, robot attributes (i.e., autonomy, social presence, humanoid), job attributes (i.e., job types, roles, necessary skills) and individual characteristics (i.e., technology readiness, robot bias) seem to play an important role in shaping FLEs' willingness to collaborate with service robots (Paluch *et al*., 2022). Recent conceptual insights also bring some clue regarding FLEs' acceptance of service robots, highlighting the potential importance of their perceived usefulness, ease-of-use, as well as their fit with the job and profession targeted (Xiao and Kumar, 2021).

To conclude, the literature not only shows the increasing relevance of robots as partners in delivering services, but also, and most importantly, the comparative lack of research on FLEs versus customers with regard to social robots (De Keyser and Kunz, 2022; Larivière *et al*., 2017; Brougham and Haar, 2018; Meyer *et al*., 2020). More research, including quantitative studies, is needed on FLEs' perceptions of working and collaborating with social robots (De Keyser and Kunz, 2022; Lu *et al*., 2019; Meyer *et al*., 2020)—with the ultimate goal to enable scholars and practitioners to understand the changing service industry, and to adequately prepare employees, employers, governments, and policy makers for the potential changes (Brougham and Haar, 2018).

Study	Research objectives	Method & sample	Context	User focus
Blaurock *et al.* (2022a)	Interdisciplinary review of research on human-robot service interactions	Review of 199 articles	Across service contexts	Customers
Blaurock *et al.* (2022b)	Interdisciplinary review of research on human-robot service interactions from a role theory perspective	Review of 139 articles	Across service contexts	Customers
De Keyser and Kunz (2022)	Comprehensive review of service robot research published in the area of service research	Review of 88 articles Interviews: 79 researchers	Across service contexts	FLEs and customers
Oderkerken-Schröder *et al.* (2022)	Customers' repatronage intentions after interactions with both service robots and FLEs	Field study: 108 customers Experimental study: 361 participants	Retail	Customers
Paluch *et al.* (2022)	FLE's willingness to work with service robots	Qualitative: 36 FLEs	Across service contexts	FLEs
Xiao and Kumar (2021)	FLEs' and customers' acceptance of service robots as well as their effects	Conceptual	Across service contexts	FLEs and customers
Choi *et al.* (2020)	Influence of human-robot interactions on service quality	Focus groups: 16 hotel managers Experimental study: 339 participants	Tourism and hospitality	Customers
Henkel *et al.* (2020)	Influence of an AI-based recognition software on FLE goal attainment and wellbeing	Field study: 2,459 service interactions	Financial services	FLEs
Lu *et al.* (2020)	Review of research on the impact of service robots on customers and employees	20 articles	Across service contexts	FLEs and customers
Meyer *et al.* (2020)	Acceptance of service robots by FLEs	Qualitative: 24 FLEs	Retail	FLEs
Lu *et al.* (2019)	Customers' long-term willingness to integrate AI and service robots into regular service transactions	Scale development: 1348 participants (students and workers)	Tourism and hospitality	Customers
Wirtz *et al.* (2018)	Potential role service robots will play in the future	Conceptual	Across service contexts	FLEs and customers
Stock and Merkle (2017)	Acceptance of frontline service robots during service encounters	Interviews: 63 participants Experimental study: 82 students	Across service contexts	Customers
van Doorn *et al.* (2017)	Impact of automated social presence on service and customer outcomes	Conceptual	Across service contexts	Customers
Hameed *et al.* (2016)	User acceptance of social robots	Experimental study: 97 participants	Domestic	Customers
de Graaf and Ben Allouch (2013)	User acceptance of social robots	Experimental study: 60 students	Domestic	Customers
Park and del Pobil (2013)	User acceptance of service robots	Web-based survey: 904 users	Domestic	Customers

Tab. 1. Overview of articles examining user acceptance of service robots

3. Hypotheses development

The present research aims to investigate FLEs' perceptions of embodied social robots and to understand their acceptance of this emerging technology. According to the technology acceptance model (TAM), stemming from the theory of reasoned action (TRA), users' adoption of new technologies in an organizational context is influenced by their attitude—whether generally favorable or not—toward them (Davis *et al.*, 1989). The TAM initially aims to explain user acceptance and rejection of computer-based technology and states that a positive attitude toward technology has a significant influence on adoption behaviors (Davis *et al.*, 1989). A common attempt to investigate users' acceptance of robots, therefore, focuses on their attitude toward them (e.g., Park and del Pobil, 2013; Savela *et al.*, 2018; You and Robert, 2018). For this reason, the proposed integrative framework addresses

FLEs' attitude toward embodied social robots and the potential factors likely to influence it (see Fig. 1).

3.1 FLEs' perceived ease of use and usefulness of embodied social robots

The TAM postulates that perceived usefulness and perceived ease of use are key determinants of user acceptance behavior (Davis *et al*., 1989). Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance", while perceived ease of use refers to "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320). These two constructs are distinct yet related. Indeed, Davis (1989) argues that usefulness exerts a positive influence on users' attitude toward using a system, whereas "ease of use operates through usefulness" (p. 332). According to the author, the easier a system is to use, the more effort can be devoted to other activities, which contributes to improved job performance. Hence, ease of use would have a direct effect on usefulness. These key relationships underlying the TAM have been supported by numerous studies, including Park and del Pobil's study on service robots (2013). Also, in the social frontline robot acceptance model (SFRAM), the functional components of robot acceptance include two sub-dimensions: perceived usefulness and perceived ease of use (Stock and Merkle, 2017). Along those lines, several conceptual and qualitative studies in the service context advance the potential importance of perceived usefulness and ease-of-use in influencing users' (including FLEs') acceptance of service robots (Lu *et al*., 2019; Meyer *et al*., 2020; Wirtz *et al*., 2018; Xiao and Kumar, 2021). Thus, it is hypothesized that FLEs' perceived ease of use positively impacts FLEs' perceived usefulness, which in turn positively affects FLEs' attitude toward embodied social robots.

H1. FLEs' perceived ease of use of embodied social robots positively influences FLEs' perceived usefulness of those robots.

H2. FLEs' perceived usefulness of embodied social robots positively influences FLEs' attitude toward those robots.

3.2 FLEs' perceived sociability of embodied social robots

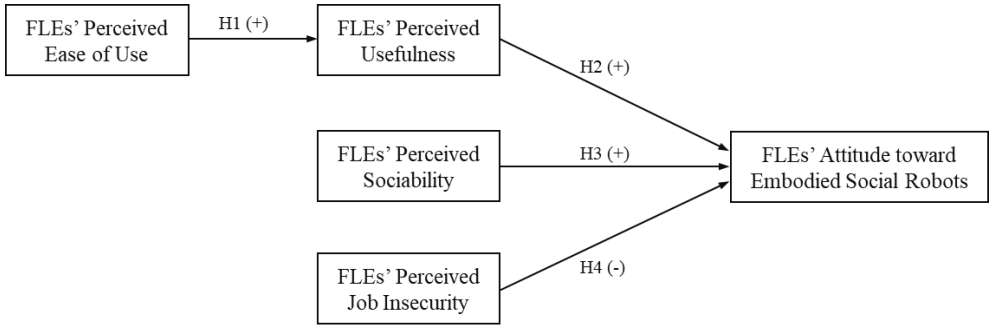
Designed for social interaction, embodied social robots require social skills (de Graaf and Ben Allouch, 2013). According to Stock and Merkle (2017), the relational components affecting customers' adoption of frontline service robots include the ability to understand their needs, especially in order to display the appropriate emotions accordingly (Wirtz *et al*., 2018). From the perspective of FLEs, this social-emotional sensitivity of robots can be particularly important to be perceived as pleasant interaction partners and drive adoption (Meyer *et al*., 2020) as well as to increase FLEs' willingness to collaborate with robots (Paluch *et al*., 2022). All in all, robots' social capabilities (i.e., social interactive skills, social intelligence, emotion expression, and dialogue system) are expected to influence FLEs' acceptance (Hameed *et al*., 2016). These social skills are grouped under the perceived sociability construct, which is defined as "the perceived ability of the system to perform sociable behavior" (Heerink *et al*., 2009, p. 529). From what precedes, it can be expected that the perceived sociability of embodied social robots can strengthen FLEs' positive attitude toward them. Hence, the third hypothesis is proposed.

H3. FLEs' perceived sociability of embodied social robots positively influences FLEs' attitude toward those robots.

3.3 FLEs' perceived job insecurity

AI and robotic advances could be perceived as a threat to human employment (Huang and Rust, 2018), especially in the service sector (Brougham and Haar, 2018). Indeed, robots' capabilities can make FLEs fear for their job (Lu *et al*., 2020; Meyer *et al*., 2020), depending on the job type and demands (Paluch *et al*., 2022). Robotization of service offerings can therefore be stressful for FLEs due to their concern about job insecurity (Subramony *et al*., 2018), which is defined as "the perception of a potential threat to the continuity of the current job" (Heaney *et al*., 1994, p. 1431). Employees' perception of job insecurity related to technology-driven changes appears as an expectation of job cuts in the near future but also of job inexistence in the longer term (Nam, 2019). These concerns can represent a major barrier to service robot acceptance (Meyer *et al*., 2020). Employees' fear of losing their own jobs or their co-workers can lead to negative attitudes toward robots and a lower willingness to work with them (You and Robert, 2018). This fear is likely to be stronger toward embodied social robots considering they tend to share more and more similarities with FLEs such as increasing social skills–which leads to the fourth hypothesis (see Fig. 1 for an overview of the four hypotheses).

H4. FLEs' perceived job insecurity negatively influences FLEs' attitude toward embodied social robots.



Note: FLEs = frontline employees

Fig.1. Antecedents of FLEs' attitude toward embodied social robots

4. Research design

4.1 Method

To test the framework in Fig. 1, an online survey was developed. After being introduced to the study, participants (i.e., FLEs) were shown a short video featuring a humanoid social robot interacting with a consumer in a retail store. Subtitles were embedded into the video to communicate about the robot's capabilities. Observing that people with no experience of robots rely on social representations of their attributes and qualities, Savela *et al*. (2018) recommended using some type of illustration as a way to control the variance of imagination when measuring attitude toward robots.

Besides the video, an online questionnaire was designed (in English and French), consisting of structured questions aiming to measure the core constructs of the integrative framework. Participants were asked about the industry they worked in, the size of their company, their age, gender, position, and whether they were responsible for collaborators.

Before sharing the survey, two sets of pilot-tests were conducted online to eliminate potential problems, detect any cultural biases, make wording and layout clear as well as determine the time needed to fill it out. Following Malhotra *et al*.'s (2017) recommendations, the French version was pilot-tested on monolingual subjects in their native language, while the French and English versions were proposed to bilingual subjects. Eight FLEs participated in the pilot-tests, including five monolingual subjects and three bilingual subjects. They were asked to fill out the questionnaires and give comments on the content, wording, sequence, layout, and instructions. Minor changes were made on the basis of the participants' feedback.

4.2 Measures

The different constructs investigated in this study were measured using items from several validated scales that have been adapted to the context of the present research. A detailed list of all items used can be found in the Appendix. Attitude toward service robots was measured using a three-item scale adapted from Davis *et al*. (1989). Perceived usefulness and perceived ease of use were measured using three-item scales adapted from Davis (1989). Perceived sociability was captured using a three-item scale adapted from Heerink *et al*. (2009). Finally, perceived job insecurity was measured using a three-item scale adapted from De Witte (2000) and Hellgren *et al*. (1999). All items were measured on seven-point Likert scales (1 = strongly disagree, 7 = strongly agree). Finally, demographic characteristics—such as age, job tenure, gender, industry, position, company size, and responsibility—were asked (see Tab. 2 for an overview).

4.3 Participants

The survey used for this study was shared online to reach a broad range of FLEs working in various service industries. First, the subjects counting among the authors' acquaintances were approached through social media. After completing the questionnaire, they were asked to share it with other individuals from the population of interest. Additionally, the survey link was shared on Facebook groups of employees from different major retailers in Belgium. A total of 165 filled-out surveys, 68% of which by female participants, were collected (N = 165). The participants' ages ranged from 18 to 67 years (mean = 35 years, standard deviation = 14 years)—see Tab. 2.

		n	%
Gender	Male	53	32%
	Female	112	68%
Age	18-24	55	33%
	25-34	49	30%
	35-44	17	10%
	45-54	20	12%
	55-67	24	15%

		n	%
Industry	Food	55	33%
	Furniture	14	9%
	Cosmetics	10	6%
	Clothing	36	22%
	Hospitality	14	9%
	Pharmacy	3	2%
	Sport and leisure	8	5%
	Telecommunication	8	5%
	Other	17	9%
Position	Worker	7	4%
	Employee	139	84%
	Manager	12	7%
	Officer	6	4%
	Other	1	1%
Company size	Small	66	40%
	Large	99	60%
Job tenure	1-10	121	73%
	11-20	18	11%
	21-30	12	7%
	31-42	14	9%
Responsibility	No	122	74%
	Yes	43	26%

Note: N = 165

Tab. 2. Participants' demographics

5. Results

5.1 Validity and reliability checks

Before evaluating the structural model, the validity and reliability of the data were examined. Concerning reliability, the analysis revealed that all constructs exhibit satisfactory internal consistency as Cronbach's alpha range from 0.90 to 0.96 (see Tab. 3). The convergent validity of the data was then tested. Accordingly, the (1) loadings of individual items, the (2) composite reliability (CR) of each reflective construct, together with the (3) average variance extracted (AVE) were tested. According to the criteria defined by Fornell and Larcker (1981), the loadings of the individual items must be at least 0.70 for the data to be considered valid. This criterion was fulfilled as all loadings are at least 0.89. Concerning the composite reliability of each construct, the recommended threshold is 0.8 (Fornell and Larcker, 1981)—which was met as all constructs had a CR of at least 0.94. The AVEs must be at least 0.5; this criterion was also fulfilled as AVEs were at least 0.84 (see Tab. 3 for an overview of the CRs and AVEs). From this, it is concluded that the data had sufficient levels of convergent validity among the reflective constructs. Next, the discriminant validity of the data was examined by comparing the correlation values presented in Tab. 3 with the square roots of the AVEs presented diagonally. The table shows that the square roots of the AVEs are consistently higher than the correlation values. These findings give evidence of discriminant validity.

Variable	α	CR	AVE	1	2	3	4	5
1. Attitude toward service robots	0.96	0.97	0.92	***0.96***				
2. Perceived usefulness	0.93	0.96	0.88	0.85	***0.92***			
3. Perceived ease of use	0.91	0.94	0.84	0.76	0.75	***0.92***		
4. Perceived sociability	0.90	0.94	0.84	0.76	0.69	0.69	***0.92***	
5. Job insecurity	0.95	0.97	0.91	-0.56	-0.43	-0.48	-0.47	***0.95***

Notes: All correlations are significant at $p < 0.001$; the square root of the AVE is on the diagonal; α = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted

Tab. 3. Descriptive statistics and correlations

5.2 Common method variance

As a single informant (i.e., FLEs) was used to capture all variables, a range of procedures were used in an attempt to minimize the potential for common method variance (Campbell and Fiske, 1959). First, the items were formulated as clearly, concisely, and specifically as possible. Second, computer-administered questionnaires were used, which should reduce social desirability biases (Podsakoff *et al*., 2003). The questionnaire's introduction specified that this was anonymous. Third, the design of the web-based survey instrument made it impossible for respondents to retrieve their answers from earlier questions. Therefore, it was more difficult for them to maintain artificial consistency between answers or search for patterns in the questions, which helped control for both the consistency motive and social desirability biases (Podsakoff *et al*., 2003). Fourth, Harman's one-factor test was used to test for common method variance (Podsakoff and Organ, 1986). A principal component factor analysis of the dependent and independent variables yielded two factors with eigenvalues higher than 1.0, while the first factor explained less than 63% of the total variance. As these statistics suggest the absence of one major factor (Podsakoff and Organ,1986), common method variance does not seem to be present in the data.

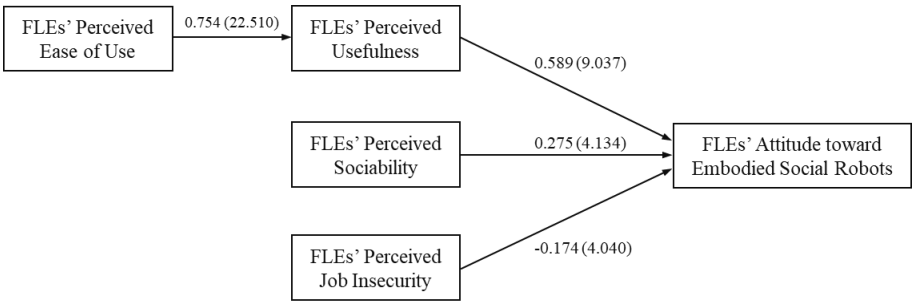
5.3 Model fit testing

After ensuring the validity and reliability of the data, the proposed research model was tested (see Fig. 2). The SmartPLS implementation of partial least squares (PLS) structural equation modeling was used to estimate the theoretical model (for an overview of its use, see Ringle *et al.*, 2012). PLS-SEM is recommended in different situations such as "when the research objective is to better understand increasing complexity by exploring theoretical extensions of established theories (exploratory research for theory development)" (Hair *et al.*, 2019, p. 5).

The explained variances (i.e., R^2 values) for perceived usefulness and FLEs' attitude toward service robots are 0.57 and 0.81, respectively—which indicates that the proposed conceptual model has adequate explanatory significance. Further, two model fitting parameters were used: the Standardized Root Mean Square Residual (SRMR) and the Normed Fit Index (NFI). SRMR values less than 0.08 are considered a good fit while NFI values above 0.90 usually represent acceptable fit (Hair *et al.*, 2017). In the present study, the SRMR value is 0.055 (< 0.08) and the NFI is 0.88 (a value that is very close to 0.90)—indicating the data fits the model well.

5.4 Hypothesis testing

A bootstrapping procedure (500 subsamples; 165 cases) was applied to assess the significance of the path coefficients (Henseler *et al.*, 2009). The path estimates (i.e., β) and relative t-values of the structural model appear in Fig. 2 as the path coefficients were used to test the proposed hypotheses. The first hypothesis was supported as perceived ease of use positively influences perceived usefulness (standardized path coefficient = 0.754; t-value = 22.510). In support of H2, a significant, positive relationship was found between perceived usefulness and attitude toward service robots (standardized path coefficient = 0.589; t-value = 9.037). Support was also found for H3; there was a significant, positive relationship between perceived sociability and attitude toward service robots (standardized path coefficient = 0.275; t-value = 4.134). Finally, H4 was also supported as perceived job insecurity negatively influences attitude toward service robots (standardized path coefficient = -0.174; t-value = 4.040).



Note: Standardized path coefficients (i.e., β) and t-values (between brackets) are reported. All p values of the structural model are significant at: $p < 0.001$

Fig. 2. Structural model results

Further, the recommendations of Baron and Kenny (1986) were followed to test if perceived usefulness mediates the relationship between perceived ease of use and attitude toward service robots. A non-parametric bootstrapping procedure (Preacher and Hayes, 2008) revealed that perceived usefulness fully mediates the relationship between perceived ease of use and attitude.

6. Conclusion

The present study examines the perceptions of FLEs regarding the infusion of embodied social robots in customer service, with the view of uncovering the factors influencing their attitude toward this promising technology. Drawing on prior research, an integrative framework is proposed, empirically tested and validated. The results of the structural equation modeling confirm that perceived usefulness and perceived sociability positively influence FLEs' attitude toward embodied social robots, whereas perceived job insecurity affects it negatively. The findings also reveal that perceived usefulness is positively influenced by perceived ease of use, and mediates the relationship between perceived ease of use and attitude toward service robots. These insights into FLEs' perceptions of embodied social robots have interesting theoretical as well as managerial implications.

6.1 Theoretical implications

This study contributes to the emerging literature on technological changes, focusing on the introduction of

embodied social robots in customer service. First, an important theoretical contribution lies in the investigation of an emerging perspective for service research, that of FLEs. In fact, this study answers a call for further research on examining employee perceptions about service robots. Indeed, De Keyser and Kunz (2022, p. 177) recently state: "research is needed to understand how internal firm processes should be adapted when integrating service robots, how service robots impact the organizational culture and what internal and external enablers vs barriers are driving/hindering their successful implementation". Therefore, by examining FLEs' attitudes toward embodied social robots and what might influence it, we aim to contribute to this nascent field of research. As highlighted by Wirtz et al. (2018), various key stakeholders must be examined when studying robots: customers, service firms, but also (frontline) employees. Those three stakeholders are best represented in a triangle relationship with robots at the heart of the triangle while each key stakeholder represents one of the three corners of the triangle.

Second, the present work also contributes to human-robot interaction research by examining simultaneously a combination of variables that could lead to the acceptance of embodied social robot by FLEs. In particular, we show in a structural comprehensive model that FLEs' perceived usefulness and sociability of robots positively influence FLEs' attitude toward robots—while FLEs' perceived job insecurity negatively influence FLEs' attitude toward robots. Those results are consistent with Meyer *et al.*'s study (2020) who found that perceived job insecurity is a barrier to FLEs' acceptance of robots, which implies that the more FLEs perceive robots as a potential threat to the continuity of their job, the less favorable they will be toward working with them. These findings accord with previous research on employee perceptions of technology. For instance, You and Robert (2018) mention that employees' negative attitude toward robots can be engendered by the fear that robots will eventually take their jobs. Nam (2019) also highlights the close link between employees' perceptions of job insecurity and attitude toward the adoption of technologies.

Third, the findings show that perceived ease of use positively influences perceived usefulness, which in turn exerts a positive influence on attitude toward embodied social robots. In fact, the more FLEs perceive embodied social robots as easy to use and to interact with, the more they believe that their use will increase their work performance, and the more favorable they will be toward them. The study therefore confirms these key relationships and discloses the mediating role of perceived usefulness in the relationship between perceived ease of use and attitude. As well, the data support previous studies and models: namely SFRAM and sRAM, which consider perceived usefulness and perceived ease of use key drivers of service robot acceptance (Stock and Merkle, 2017; Wirtz *et al.*, 2018), and the model of Meyer *et al.* (2020), which reveals that FLEs are more likely to adopt embodied social robots if practical advantages are perceived. Such practical advantages are likely to be particularly prevalent in situations of "augmentation" of the service employee, that is to say when technologies supplement the service employee's role and capabilities (Larivière *et al.*, 2017; Blaurock *et al.*, 2022b) as a clear functional benefit of better serving customers appear. The technology is also likely to be valuable in instances of "substitution", for more repetitive and mindless tasks, in which ease of use is of particular relevance, as the easier a mindless task is to perform, the more satisfactory (Larivière *et al.*, 2017).

Fourth, the findings show that perceived sociability positively affects attitude toward embodied social robots, thus acting as a driver of FLEs' acceptance of embodied social robots. Indeed, it was suggested that the favorableness of FLEs to work with robots depends on the robots' abilities to perform sociable behavior, such as displaying appropriate emotions (Wirtz *et al.*, 2018), understanding users, and providing logical answers (Hameed *et al.*, 2016). In a qualitative study, Meyer *et al.* (2020) also suggest that the quality and pleasantness of interactions are important for FLEs in the adoption of service robots. We show in a quantitative study the importance of robots' sociability in enhancing FLEs' attitude toward robots—above and beyond other key antecedents of FLEs' attitude toward robots. Accordingly, scholars could further examine which (combination of) aspects of robots could enhance FLEs' perceived sociability of robots (tone of voice, type of smile and eye contact, type of rapport-building behaviors…).

6.2 Managerial implications

It appears from the data that FLEs' attitude toward service robots is positively influenced by the perceived usefulness and the perceived sociability of the technology while being negatively influenced by perceived job insecurity. Additionally, the perceived ease of use of service robots is found to positively impact their perceived usefulness. Such findings have three main managerial implications to overcome FLEs' negative attitude toward service robots and increase their overall acceptance in the workplace.

First, the perceived usefulness of embodied social robots, which is influenced by their perceived ease of use, is found to be a predictor of FLEs' positive attitude toward the technology. Consequently, managers should consider showcasing the user-friendliness of robots they wish to implement in their organizations by, for instance, providing training sessions in which their employees can interact and experiment with the robots beforehand;

such opportunities might change their view of the effort needed to efficiently work with them. As well, clear information concerning the robots' various abilities and specific tasks would boost FLEs' confidence that these digital 'colleagues' will effectively help them better execute their job. On the manufacturer's side, ensuring that robots are well-designed, user-friendly, and user-centric for both FLEs and customers is a crucial requirement.

Second, positive attitudes were also found to be fostered thanks to the perceived social skills of robots. In this regard, robot providers should strive to create robots that are social creatures, competent in social situations, and able to communicate in a similar way to humans, especially by using voice as well as facial and emotional recognition sensors. It is up to service managers to choose the best suited robot to their context, considering that its relative social intelligence and skills may condition its successful implementation and acceptance by FLEs. The right amount of sociability needs to be carefully crafted, so as to generate positive attitudes without being threatening for FLEs. These skills could further be promoted through real-life demonstrations.

Third, the findings show that attitudes could be impacted negatively by the fact that FLEs regard embodied social robots as a threat to the continuity of their job. So, it is important for managers to be transparent regarding the changes coming ahead in their organizations and their exact motivations for implementing such technology. The specific roles of FLEs and embodied social robots should be precisely defined and delineated, and FLEs should be given space to undertake more customer-oriented work and be encouraged to collaborate with embodied social robots to take advantage of their mix of skills when delivering services. In short, embodied social robots should be perceived by FLEs as an augmenting rather than a substituting force, and should always complement staff with the view of delivering the best service experience to consumers. In particular, when FLEs consider robots to be at threat—which could be the case when they perceive robots to be not only useful but also sociable—FLEs' concerns for job insecurity can be high. Therefore, to lower FLEs' concerns for job insecurity, managers could exchange with their FLEs' on how robots can be reliable subordinates for simple cognitive and/or emotional tasks while enhancing FLES' job conditions by helping FLEs to focus on key and complex tasks requiring high cognitive and/or emotional skills—that cannot be achieved by robots. Further, it could be also suggested to designers that a subtle trade-off is necessary when designing robots: while robots should be (perceived as) useful and sociable, robots should stay distinct from FLEs' strengths and characteristics to avoid FLEs' fear for job insecurity due to perceived substitution of FLEs' by robots.

6.3 Limitations and further research

While this study provides insights into FLEs' perceptions of embodied social robots, it has some limitations. First, the sample size hinders generalizing the results. Also, quick and inexpensive a method as it is, judgmental sampling does not allow direct generalization to a particular population (Malhotra *et al*., 2017). Further research could therefore replicate this study with a wider audience and use respondents that are more representative of the population, such as respondents recruited through probability sampling.

Second, participants were introduced to an embodied social robot through a video. The results may differ from a study where participants are directly exposed to such a robot in a real-life context (You and Robert, 2018; Savela *et al*., 2018). It could therefore be relevant to conduct such a study and compare the results with ours. Further, a real-life context could also extent the study to incorporate actual responses and engagement of FLEs toward the technology, beyond attitudes.

Third, a limited set of variables were identified as core determinants of FLEs' attitude toward embodied social robots. Further elaborations of the model could include and test additional variables such as, for instance, the anthropomorphism of robots (van Doorn *et al*, 2017). Studies also suggest that for consumers, robot usage also depends on consumers' preferences, role enactment (Blaurock *et al.*, 2022b) attribution of responsibility (Jörling *et al.*, 2019), or even type of situation (Pitardi *et al.*, 2022). FLEs' job (in)security in the age of social robots may thus require the investigation of different types of contexts and situations.

Fourth, cross-sectional designs also bring limitations. An experimental research design would help identifying with more accuracy the specific context and conditions under which FLEs' attitude toward embodied service robot vary, which may be linked to robot, or employee characteristics (Paluch *et al.*, 2022) and roles, as well as industry or service type.

Fifth, an experimental study could be done to best understand the relationships between the variables of our model. For instance, an experimental design could allow to determine if usefulness and sociability of robots could generate fear of job insecurity among FLEs. Indeed, job insecurity could occur if high levels of usefulness and sociability among robots are achieved—as a consequence of the increasing qualities of robots that used to be unique to human employees. Thus, such a 3*3 between-subjects factorial design (both usefulness and sociability would vary according to three levels: low, medium, high) could help to precisely determine the optimal levels of usefulness and sociability of robots to minimize FLEs' perceptions of job insecurity.

Finally, the emergence of embodied social robots raises a wide range of ethical concerns deserving researchers' special attention, such as the moral intelligence and rights of service robots, the specific ethical norms applicable to the implementation of service robots and the prevention of unethical behaviors of robots (Lu *et al*., 2020). Ultimately, users' perceptions might change as robotics develops functional, emotional-social, and relational components. Therefore, FLEs' perceptions of embodied social robots should be studied over time.

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Appendix: Questionnaire items

Construct	Items
Attitude toward service robots (adapted from Davis *et al.*, 1989)	1. I believe it is a good idea to use service robots 2. I would enjoy working with service robots 3. I have a generally favorable attitude toward service robots
Perceived usefulness (adapted from Davis, 1989)	1. I think that service robots are useful 2. Service robots would enable me to accomplish tasks more quickly 3. Service robots would increase my productivity
Perceived ease of use (adapted from Davis, 1989)	1. It would be easy for me to interact with service robots 2. Learning to use service robots would be easy for me 3. I would find service robots easy to use
Perceived sociability (adapted from Heerink *et al.*, 2009)	1. I would consider service robots pleasant conversational partners 2. I would find service robots pleasant to interact with 3. I feel service robots would understand me
Perceived job insecurity (adapted from De Witte, 2000; Hellgren *et al.*, 1999)	1. I feel insecure about the future of my job due to service robots 2. I think I might lose my job in the future due to service robots 3. I believe that the organization will need my competence also in the future *

* Reversed item

Note: Considering the time constraints of the population of interest (FLEs), when the measure included more than three items, only three items were included to keep the survey as short as possible to maximize the response rate. Doing so allowed the authors to test the model while preventing respondents' fatigue due to a lengthy questionnaire with questions that may be perceived as similar.

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